MODERN PLASTICS

MARCH 1950

It pays to use your custom molder's know-how

– as the Morse Chain Company was pleased to discover

No. 15 in a series on Plastics Skill at Work...

PROJECT
Oil-tight coupling cover, highly resistant to corrosion

CUSTOMER
Morse Chain Company
Detroit

MOLDER
Michigan Molded Plastics, Inc.

MATERIAL
Rag-filled, impact type Durez phenolic plastic

STARTING WITH INSIDE DIMENSIONS required for clearance of flexible chain, the custom molder developed and produced this safe, attractive split cover of Durez phenolic plastic. The only tool required for assembly is an ordinary screwdriver.

PROPERTIES OF DUREZ plastics make this material highly desirable where gritty or moist atmosphere, or corrosion from acids or alkalies, can shorten the life of metal covers. Bosses and recesses, including tapered grooves for oil seals, are molded in.

● Plastics continue to open up new opportunities for manufacturers to make their products serve better or longer, or better *and* longer. As an example, a metal part may be perfectly satisfactory in some types of service, while in others the same part in phenolic plastic will serve better. This is where it pays to call in a good custom molder.

The Morse Chain Company reasoned thus, and the developments that followed are now helping to make new users of Morse flexible chain couplings. Among the properties of Durez that appealed to Morse executives particularly were its high resistance to acids and alkalies, and its freedom from corrosion. Obviously in some industries these are dangerous hazards for metal covers. Michigan Molded Plastics were asked to work up a grit-proof and dust-proof plastic cover that would be compact, strong, easy to assemble, and of smooth exterior form.

The housing that resulted from this cooperation not only can provide sealed-in lubrication and maximum protection for the entire life of the coupling when suitable lubricant is used. It also adds to the appearance of the equipment on which it is mounted.

Your custom molder too can bring judgment and skill to questions that bear on plastics. He can say which Durez compound best combines the electrical, chemical, and mechanical properties you want — and he knows that a Durez technician is always available for competent help. Call on him.

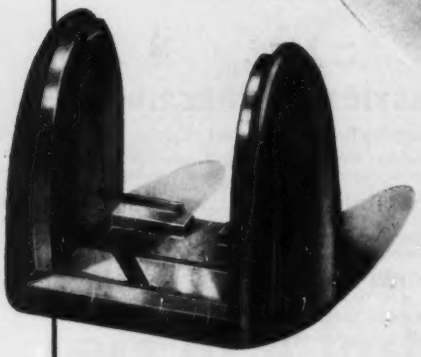
A bit with plastics users everywhere is the handy "Durez Check-Chart." Write for yours. Durez Plastics & Chemicals, Inc., 123 Walck Rd., N. Tonawanda, N. Y.

DUREZ

PHENOLIC RESINS

- MOLDING COMPOUNDS
- INDUSTRIAL RESINS
- PROTECTIVE COATING RESINS

PHENOLIC PLASTICS THAT FIT THE JOB



A CASE FOR CAST *Catalin*

For selective markets . . . For moderate quantity runs . . . For comparably low tooling costs . . . For the advantage of being able to order as needed—Catalin *Cast* Phenolic is the plastic to choose. Augmenting these favoring-factors, Catalin's decorative quality, as well as its physical electrical and mechanical properties were, as shown here, most successfully applied to a desk-type microphone housing for the Gray Audograph Electronic Soundwriter*.

Whenever you have a plastic project in the blueprint stage, one of Catalin's service staff will be very happy to assist your materials planning. Inquiries invited.

CATALIN CORPORATION OF AMERICA
ONE PARK AVENUE, NEW YORK 16, N. Y.

*Product of
Gray Manufacturing Co.
Hartford, Conn.

MODERN PLASTICS*

VOLUME 27 MARCH 1950 NUMBER 7

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PUBLICATION OFFICE: Orange, Conn. Executive and Editorial Office: 122 E. 42nd St., New York 17, N. Y. Published each month by Modern Plastics, Inc. Entered as second class matter at the Post Office at Orange, Conn., under the act of March 3, 1879.

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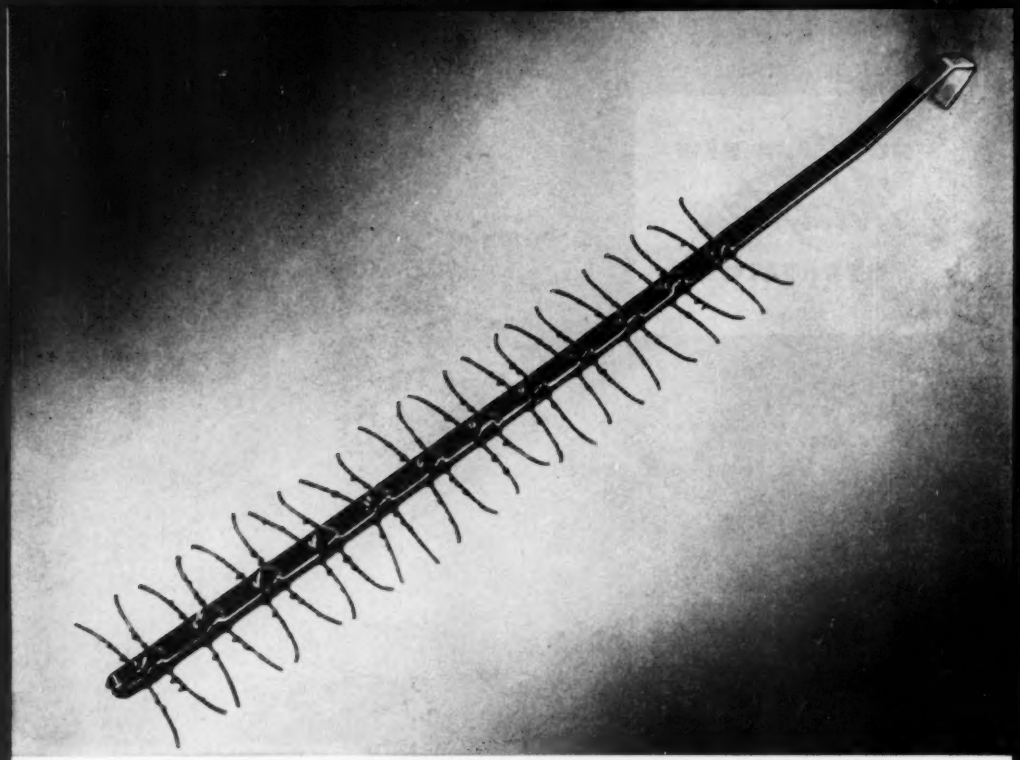
Subscription $5.00 a year, $8.00 for two years in the U. S., its possessions, and South America. Canadian subscription $5.00 a year, $8.00 for two years. All other countries $5.00 a year, $8.00 for two years, payable in U. S. currency. Price of this issue 75 cents per copy.

*Reg. U.S. Pat. Office



Geon plastisol coating by the Chemical Division, Michigan Chrome and Chemical Company, Detroit, Michigan.

Less of it lasts longer ...that's a GEON coating!

THE picture above shows a plating rack coated with a plastisol made from Geon paste resin. The rack was used for *six months* in a copper-nickel-chrome plating cycle. The protective Geon coating *still* adheres tightly and shows little effect from the corrosive baths or electrical current.

With plastisols made from Geon paste resin, seldom more than two coatings are required for racks—in many cases only one. Formerly, from seven to ten solution coatings were needed. These often failed after two or three weeks' service. What a difference Geon makes!

Think of these extra advantages. Plastisols made from Geon paste resin make it possible, for the first time, to single dip and obtain pickup weights that cover most field requirements. Coatings can be applied with thicknesses ranging from a few mils to ¼" or more per dip.

They're highly resistant to chemicals and abrasion. They can be compounded in a wide color range. They're easy to process—safely and at low cost.

There are many uses for Geon paste resin—coating textiles, paper and fiber-glass . . . dip-coating plating racks, gloves, dish racks, etc. . . . molding toys and dolls, prosthetic devices, artificial fish lures, mechanical parts. Geon may be just what you're looking for to improve or develop more saleable products, cut costs, help you increase your sales. For further information, please write Dept. GA-3, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

B. F. Goodrich Chemical Company

A DIVISION OF THE B. F. GOODRICH COMPANY

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers

Chicago Molded Plastics, of course!

● *Strikingly beautiful, with its smooth surfaces of gleaming white, the new Maytag Automatic Washer now brings to the automatic field the advantages of Maytag's sound engineering and efficient, dependable performance. At the heart of this new machine is a new Gyratator in the characteristic Maytag red giving the housewife, for the first time, the advantages of the Gyrafoam washing principle in an automatic washer. Through its experience in building literally millions of washers, Maytag has found that the Gyratator of molded phenolic plastics, more than any other material, resists the action of modern soaps and detergent solutions. It keeps its smooth, sleek surfaces through years of constant use and combines super-efficient cleansing action with maximum gentleness to fabrics.*

* * * *

It is natural that Maytag, who pioneered and perfected the modern agitator-type washing machine, should turn to Chicago Molded as a major source of supply. For CMPC originated the modern technique of molding agitators. And it is particularly significant that the first Gyratator mold, built by CMPC for Maytag nine years ago, is among the several molds in regular daily production here producing agitators for Maytag washers of the conventional and automatic types.

The ability of Chicago Molded to produce right from the start is no mere accident. It comes as the result of more than 30 years in pioneering many of the most important commercial applications for plastics today . . . plus unsurpassed facilities for all types of plastics molding . . . compression, plunger, and injection.

This same experience and these same facilities are at your disposal for your next plastics molding job. A consultation with a Chicago Molded engineer involves no obligation on your part. Just write or phone.

CHICAGO MOLDED PRODUCTS CORPORATION

1046 N. Kolmar Ave. Chicago 51, Illinois

Representatives in principal industrial centers

COMPRESSION, INJECTION AND PLUNGER MOLDING OF ALL PLASTIC MATERIAL

EDITORIAL

So the Consumer Can Understand

AS we go to press, the Informative Labeling Committee of The Society of the Plastics Industry, Inc., is preparing to present its report to the S.P.I. Board of Directors, with suggestions for the further development of the Informative Labeling Program.

One suggestion that met with the unanimous approval of all members of both subcommittees and the committee proper, is that S.P.I. recommend that all informative labels should carry in addition to the trade name of the plastics material, the "commonly accepted generic term" for that material.

This, in our opinion, would be a major move in the right direction!

In the first place, it would speed up simplification of generic terms and cooperation in the selection of suitable terms for public recognition. Either acrylic or methyl methacrylate would have to be decided upon; either polyethylene or polythene would have to be chosen; either styrene or polystyrene would become the "commonly accepted generic term." And as the industry moves into the fantastic field of copolymers, terpolymers, and still more involved combinations, the establishment of such names for new plastics materials would have to be done much more carefully than in the past when chemists' complicated technical nomenclature was the source of the so-called generic terms. To be "commonly accepted" the words employed would have to be reasonably simple.

In the second place, provided the generic terms established are not too long or complicated, provided they roll fairly easily off the tongue, there need be no worry about the housewife learning them over a period of a very few years. The average housewife can name and describe between 20 and 30 different types of fabrics, from balbriggan to voile and through a list of names that are basically just as difficult to remember as phenolic, melamine, styrene, or cellulosic. Which means that, provided simplification to a single generic term can be achieved by material makers for any given plastic material, the consumer can be expected in due course to become acquainted with that term and to relate that term to a given material and its properties in products.

The P.M.M.A. booklet, "How to Buy and Sell Plastics," based its approach on simple generic names for plastics. Now, if the S.P.I. accepts the committee's suggestion, the principle will be carried one step further. And since one of the purposes of an Informative Labeling Program is the long-term education of the public in the recognition of plastics and their properties, this would be a worthy move.

It would be well-timed, too: better to start simplifying our generic names now and to establish this simplification as a principle agreed upon by the industry than to wait until further chemical complications make the objective much more difficult to attain.

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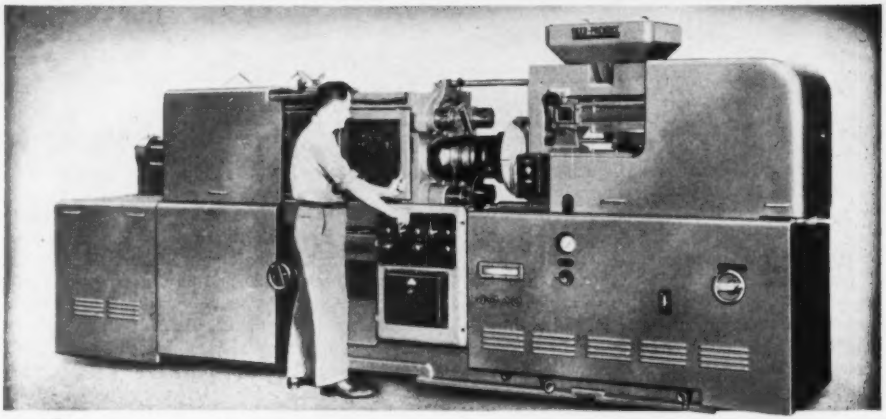
Member Audit Bureau of Circulations
MODERN PLASTICS is regularly indexed in Industrial Arts Index and Industex.



See the NEW and IMPROVED 10D-12oz. REED-PRENTICE Injection Molding Machine

. . . in Operation at the NATIONAL PLASTICS EXPOSITION

Navy Pier, Chicago • March 28 - 31 • Booths 203 - 204

We will be glad to show you the many practical features of this model — to demonstrate how the efficient heating cylinder and injection unit of the 16 Oz. machine has been combined with the popular 10D-8 Oz. double shear toggle mechanism to provide higher plasticizing capacity at lower machine cost.

Every molder will want to know about the complete Reed-Prentice line which includes models of 4, 6, 8, 10, 12, 16, 24, 32 and 60 Oz. capacity — and about Reed-Prentice mold service. Be sure to stop at Booths 203-204 . . . we'll be glad to discuss your injection molding problems.

10D-12 Oz. SPECIFICATIONS

Die locking pressure, tons	275	Max. die space	16"
Max. casting area, sq. in.	100	Size: die plates	21 x 25"
Mold opens	10¼"	Pressure psi on material	20,000

THE WORLD'S LARGEST MANUFACTURERS OF INJECTION MOLDING MACHINES

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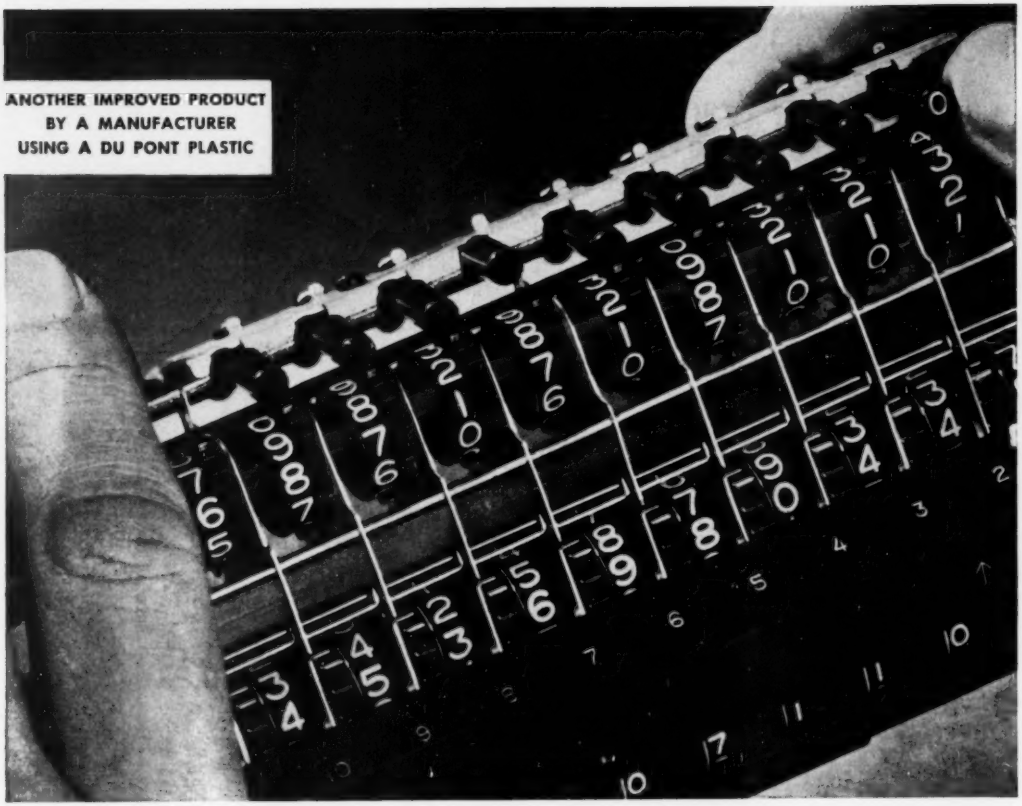
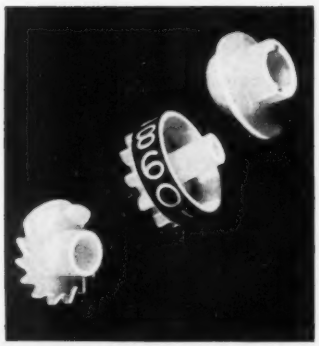


NYLON PLASTIC PARTS FOR MONROE CALCULATORS COST 67% LESS

29 production steps eliminated in making two extra-durable parts to tolerances as close as 0.0015 inch!



NEW NYLON RATCHET, counting dial (one of ten) and cam. Molding of cam saved 19 production steps, of the dials —10 steps. Ratchet is new part, only possible with nylon. Note intricate design, molded to close tolerances.

Here's an excellent example of wedding product-improvement to cost-cutting. Monroe Calculating Machine Company, by using Du Pont nylon plastic for counting dials and cams on their calculating machines, gets more durable service from these parts—and through savings in material and operations, cuts costs of the completed parts by 67%. Production steps are cut from 33 for former metal parts to only *four* for nylon. A third part, a new ratchet, is of an improved design so intricate it is possible only with nylon.

These nylon parts are molded to tolerances as close as 0.0015 inch. In actual performance tests of millions of cycles—beyond normal machine life—nylon showed hardly any measurable evidence of wear, while wear on metal parts was clearly visible. In addition, the high abrasion resistance of nylon eliminates the need for lubrication and subsequent dial cleaning, affords quieter, smoother operation.

For more information on nylon and other Du Pont plastics write today for free literature. E. I. du Pont de Nemours & Co. (Inc.) Polychemicals Department, (consolidation of the Ammonia and Plastics Departments), Plastics Sales Offices: 350 Fifth Avenue, New York 1, N. Y.; 7 S. Dearborn St., Chicago 3, Ill.; 845 E. 60th Street, Los Angeles 1, Calif.

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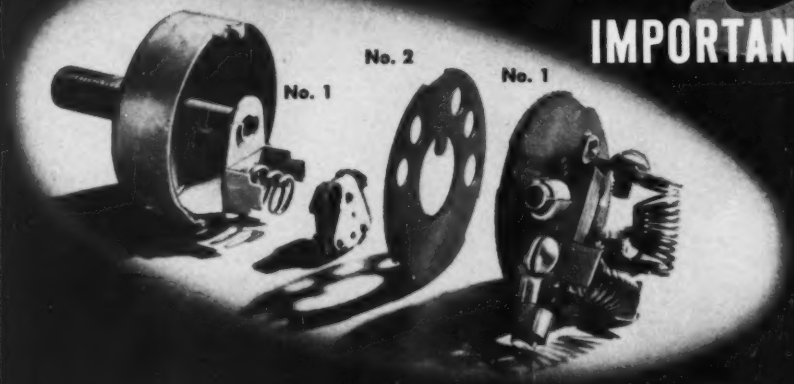
. . . THROUGH CHEMISTRY

LAMINATED INSUROK BY RICHARDSON . . .

DOES 3 IMPORTANT JOBS



. . . on a five way switch for Nash

In making a five way switch for the famous Nash Weather Eye Conditioned Air System, the Douglas Manufacturing Division, Bronson, Mich., needed three parts made of plastic insulation material that embodied a variety of characteristics. Richardson's Laminated INSUROK, in two different grades, was the answer.

One paper-base grade of Laminated INSUROK met all requirements for two of the parts because of its low moisture absorption, high strength, rigidity, dielectric strength, ease of fabrication and low cost. Another grade, with a fabric base, met special requirements for physical strength for the third part.

Two grades of INSUROK, in combination with metal components, resulted in a five way switch that will operate smoothly over long years of trouble-free use.

Perhaps Richardson's diverse materials of either Molded or Laminated plastic, standard or special, can solve a manufacturing problem for you.

INSUROK *by* RICHARDSON
Dependable names in plastics
INSUROK = Registered Trade Mark

The RICHARDSON COMPANY
GENERAL OFFICES: LOCKLAND, OHIO FOUNDED IN 1858
Sales Headquarters: MELROSE PARK, ILLINOIS
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Plastic Quality...

SUNGLASSES HAVE TO HAVE IT

- **TOUGHNESS** high impact strength in all temperatures.
- **SURFACE BEAUTY** satin-smooth surface grows more lustrous with wear.
- **TOUCH COMFORT** low thermal conductivity for wearing comfort.
- **SAFETY** shatterproof, non-flammable, odorless.
- **MACHINABILITY** no stress crazing ... no annealing.
- **UNLIMITED COLORS** mottles and pearl effects.

Sunglasses are expected to be rugged companions . . . to brave sun, wind, humidity, dryness, excessive handling and even abuse. That's why plastic quality is so important and why leading manufacturers specify Celanese plastics.

Celanese plastics—better than ever in quality and lower than ever in price—offer a wide range of formulations . . . strength in thin cross sections . . . machinability without crazing . . . satin-smoothness . . . colors, mottles and pearl effects.

Whether you are making sunglasses or other personal items, toys, electrical products or housewares, you should use Celanese plastics to make a better product. Call your Celanese representative for more information, new prices and data. Celanese Corporation of America, Plastics Division, Dept. 101-C, 180 Madison Avenue, New York 16, N. Y.

NATIONAL PLASTICS EXPOSITION MARCH 28TH—31ST, NAVY PIER, CHICAGO—CELANESE BOOTH 252.
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Celanese* **PLASTICS**

*Reg. U. S. Pat. Off.

Here's light weight and much

SYNTHANE is half the weight of aluminum. Moving parts made from this type of laminated plastics start faster, require less power to start, stop and run . . . and light weight is only *one* of the Synthane properties that make it a valuable material for you.

With Synthane you get light weight, strength, resistance to wear, dimensional stability and excellent electrical insulation, plus many other desirable mechanical, electrical and chemical characteristics. This unusual *combination* of properties has led to the use of Synthane in thousands of applications in almost every industry. It may be the material you have been seeking to help make a good product better or a process less expensive.

Electrical qualities such as high dielectric strength, low power factor and low dielectric constant, together with light weight and moisture resistance have helped put Synthane in television sets, transformers and many other pieces of electrical and electronic equipment.

Hard, dense and abrasion resistant, yet easy to machine, Synthane is a widely used material for long-wearing, high-speed gears, cams and rubbing blocks.

And so it goes in application after application —Synthane pays for itself in extra advantages over other materials. It may be helpful to you. If you have a specific material problem, write us outlining the situation. We will be glad to help with material, design, or fabrication of finished parts.

Synthane Corporation, Oaks, Pennsylvania.

SYNTHANE AT WORK IN INDUSTRY

Cleveland Pneumatic Tool Company, makers of Aerol Landing Gear Shock Strut for the U.S. Air Force Bomber, B-36, selected Synthane as the right material for the bearing shown because of light weight, wear resistance, its antifriction qualities, good compressive strength, excellent shock resistance, and the close tolerances to which it may be fabricated. Are these qualities valuable to you?

PLASTICS WHERE PLASTICS BELONG

MATERIALS • DESIGN • FABRICATION • SHEETS • RODS • TUBES

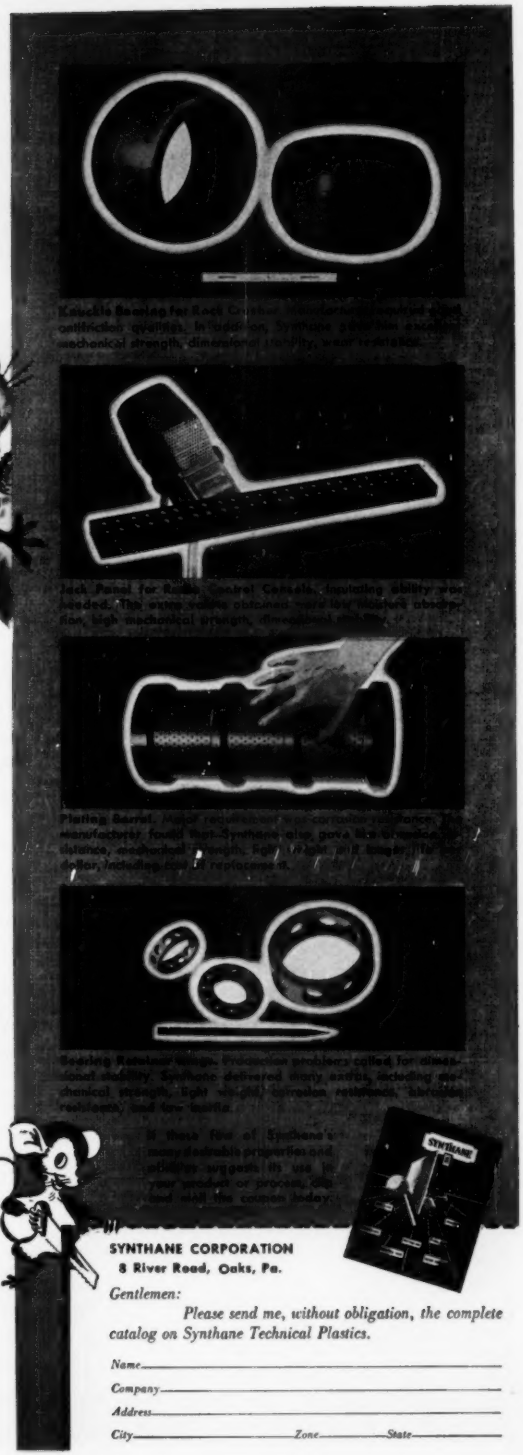
more in a material

Here

ARE YOUR ADDED VALUES

Synthane was the material selected for each of the four parts shown at the right. Each manufacturer sought one or two specific characteristics. In each application the user found that Synthane was not only a better material for the major requirement but gave him other desirable properties. This is true of almost every application, for Synthane is unusual for its *combination* of properties.

Synthane is strong, hard, light and dense. Resists abrasion, corrosion, is easily worked on standard machine tools. It is an excellent electrical insulator, has high dielectric strength, low dielectric constant and low power factor. It is a *set* plastic, dimensionally stable over a wide range of temperatures.



SYNTHANE

WHERE SYNTHANE BELONGS

MOLDED-LAMINATED • MOLDED-MACERATED

SYNTHANE CORPORATION
8 River Road, Oaks, Pa.

Gentlemen:

Please send me, without obligation, the complete catalog on Synthane Technical Plastics.

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*Company*_____

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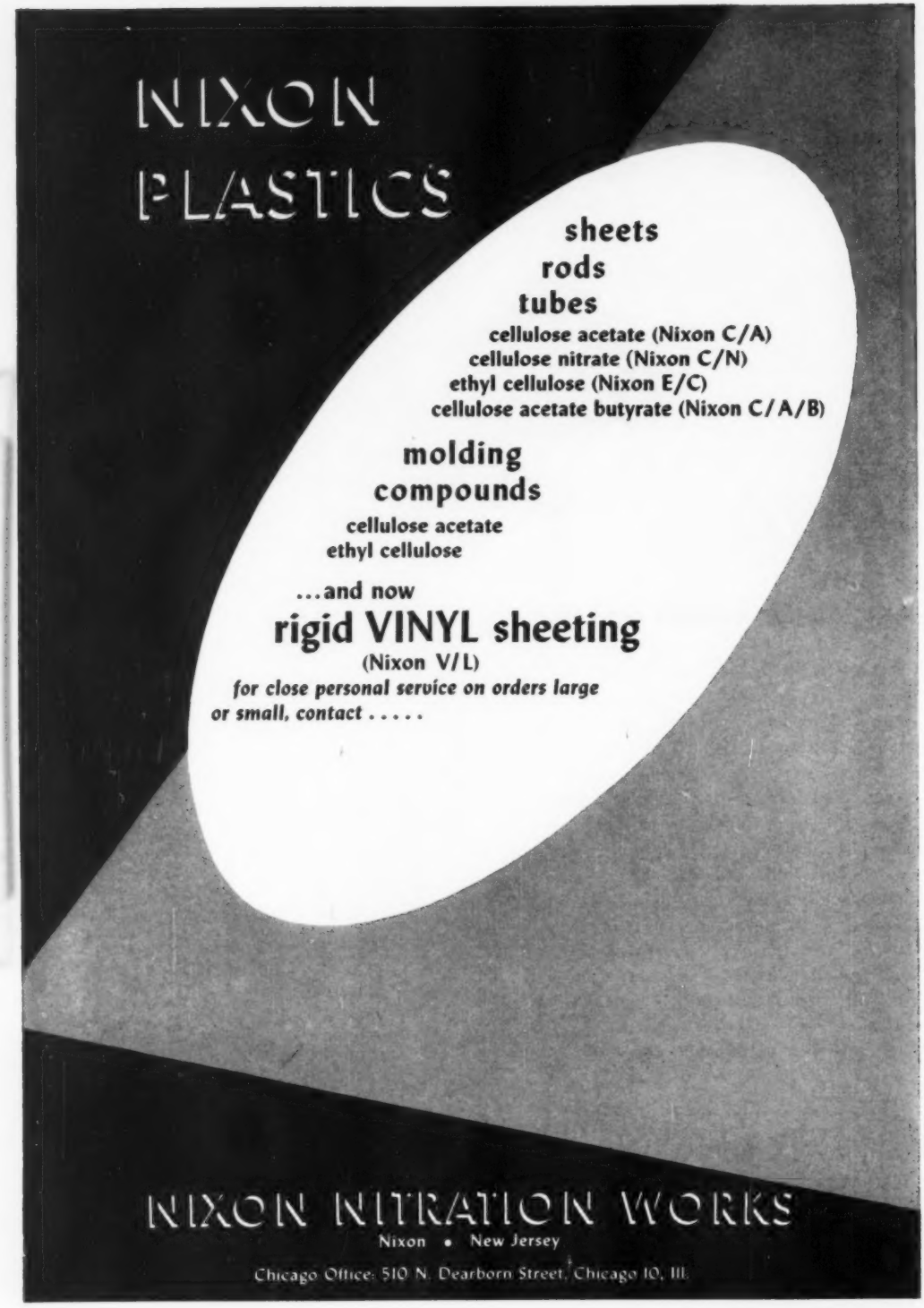
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PLASTICS
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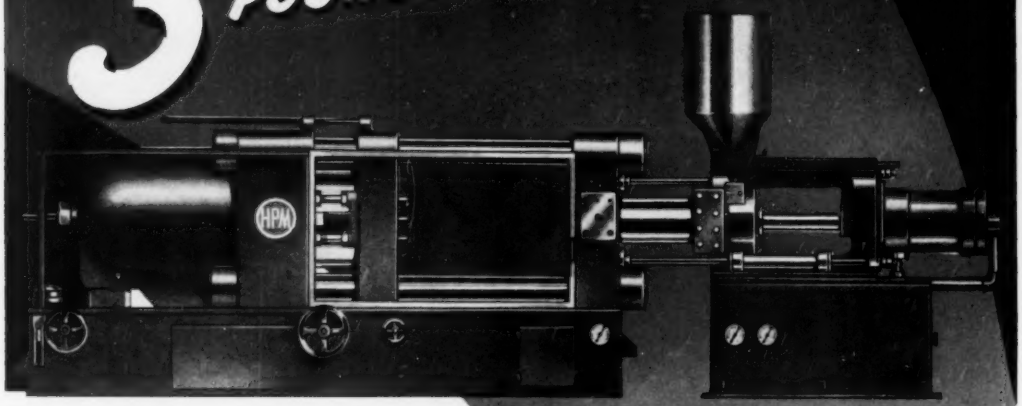
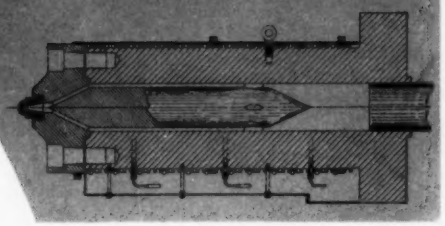


Just What You MOLDERS ORDERED!

Are you prepared to meet the demand for big plastic parts? Here's your answer! It's the new "3-pound-per-shot" H-P-M "all-hydraulic" injection machine built to help molders cash in on big jobs.

This giant H-P-M is *all new* from top to bottom . . . new fast plasticizing heat cylinder . . . new accurate material feed . . . new fast-acting 1000-ton mold clamp . . . new retractable injection unit. These, plus many other exclusive H-P-M design features will give you the kind of versatile machine operation that means PROFITS.

Plan today to get your share of this "big" plastics business! Call in a nearby H-P-M engineer to discuss the unlimited possibilities of this all-new "all-hydraulic" molding machine. Write for Bulletin 4802.



HERE'S HPM'S NEW HEATING CHAMBER

This new heat cylinder is now standard on all sizes of H-P-Ms. Field tests have proven it to be extremely efficient. Here are some of its new features . . . leak proof assembly with straight bore . . . long torpedo . . . one piece housing . . . long life tubular electric heating elements . . . fast plasticization with increased capacity . . . both nozzle and heat cylinder designed for easy removal.

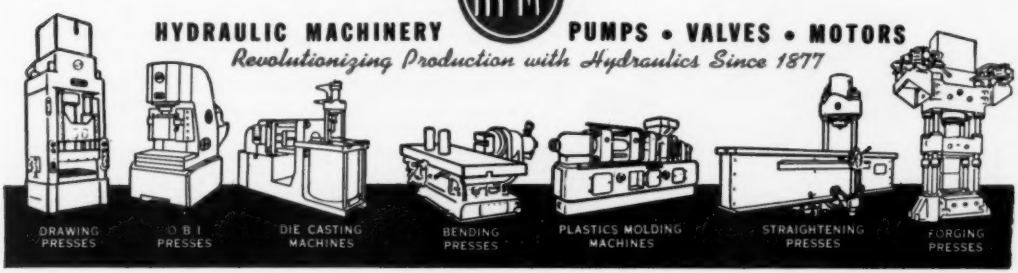
THE HYDRAULIC PRESS MFG. COMPANY

HPM

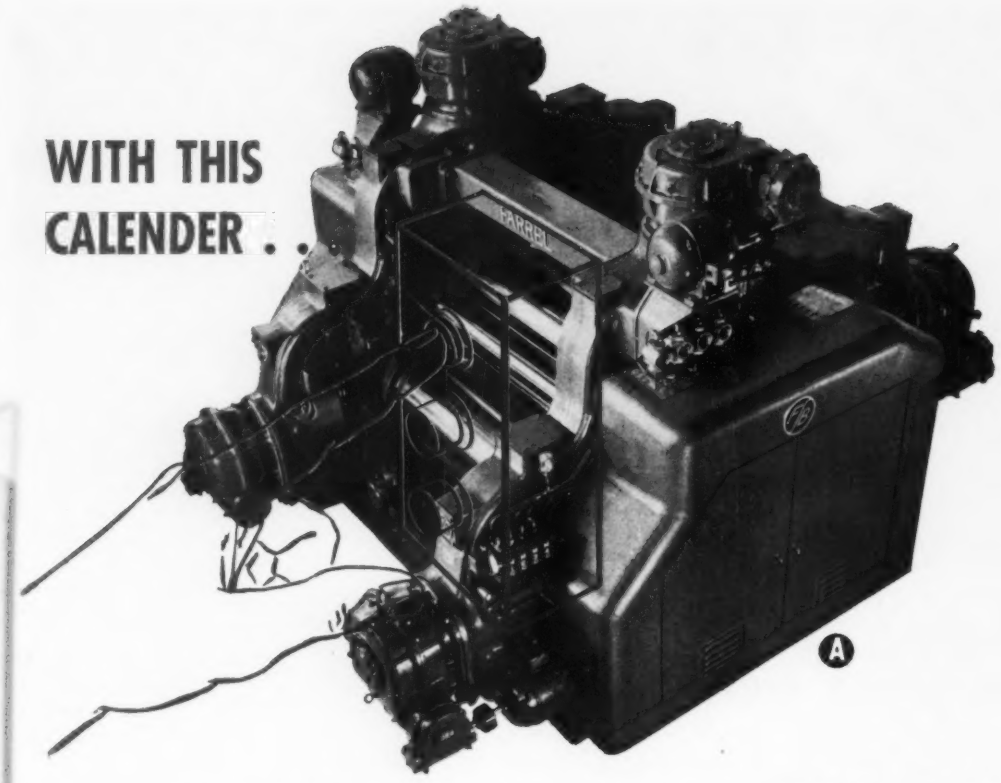
1010 Marion Road, Mount Gilead, Ohio, U. S. A.

HYDRAULIC MACHINERY PUMPS • VALVES • MOTORS

Revolutionizing Production with Hydraulics Since 1877



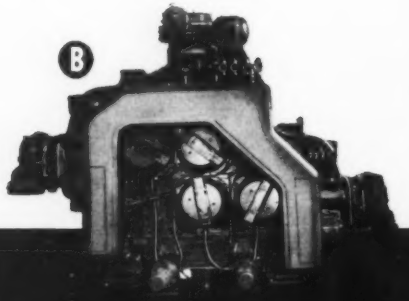
WITH THIS CALENDER . .



. . . you simply push a button to vary roll "crown"

A The Farrel-Birmingham Z-type calender was developed for production that demands extremely accurate gauge and temperature control. Plastic film is being produced regularly on the Z-type calender with a variation in thickness of only *plus or minus .0001"*.

B View showing the Z arrangement of rolls and connections for universal spindles from the uni-drive. Preloading devices eliminate backlash and hold the rolls firmly in their operating positions.



A unique feature of Farrel-Birmingham's new Z-type calender is its ability to handle a wide variety of stock compositions, at varying speeds, with extremely close control of temperature and gauge.

A built-in device for crossing the axes of the rolls compensates for roll deflection. Crossing the rolls (which is closely equivalent to varying the roll crown) is accomplished quickly by push-button control.

For film production, the two lower rolls are equipped with this device to adjust the rolls accurately for the final pass. For double coating, this feature can be installed for both upper and lower bank passes.

Among the many other advantages of this calender are: (1) Vertical pressure from a third roll cannot affect roll settings, (2) positive roll positioning provided by hydraulic pullbacks, and (3) in film production, exposure of material in initial passes limited to a 90° arc of roll surface.

Write for further information about this unique calender, or for engineering assistance on your machinery problems.

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN.

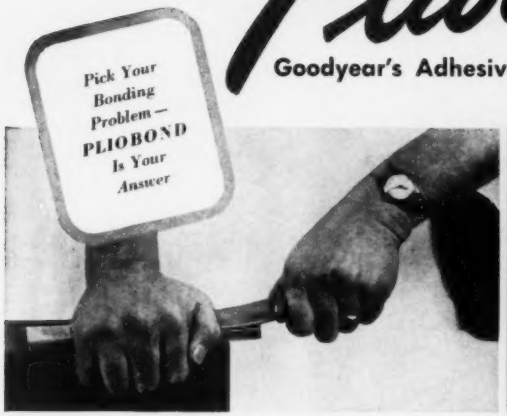
Plants: Ansonia and Derby, Conn., Buffalo, N. Y. *Sales Offices:* Ansonia, Buffalo, New York, Akron, Chicago, Los Angeles, Houston

FB 583

wanted

your toughest bonding problems for *Pliobond*

Goodyear's Adhesive that bonds "anything to anything"



Plywood to Metal

Leather to Leather

Plastic to Plastic

Plastic to Wood

Steel to Steel

HERE'S the super-adhesive you've been waiting for—**PLIOBOND**—that's made to order for your toughest production problems. It literally bonds "anything to anything." It's easily applied by brush, spray, spreading or rolling. It bonds hot (dry) or cold (wet)—bonds practically all solids to themselves or each other.

PLIOBOND gives you all these advantages:

STRENGTH • PERMANENCE • WITHSTANDS CONSTANT FLEXING • SETS QUICKLY • IMMUNE TO FUNGI • RESISTS WATER, OILS, WAX

For further details, write:

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USE PROVED *Products*

GOODYEAR

Pliobond T.M. The Goodyear Tire & Rubber Company

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In addition to the productive capacity of 6 great manufacturing plants, we offer you the combined resources and abilities of two competent engineering organizations and over 54 years experience and research in the design and creation of basic processes and machinery for the rubber, plastics and plywood industries.

If your plans include the installation of additional equipment, or the creation of new processes for unusual product requirements, consult us. Our engineers will gladly cooperate with you on all your technical problems.

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- Mills
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- Washers
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- Pot Heaters
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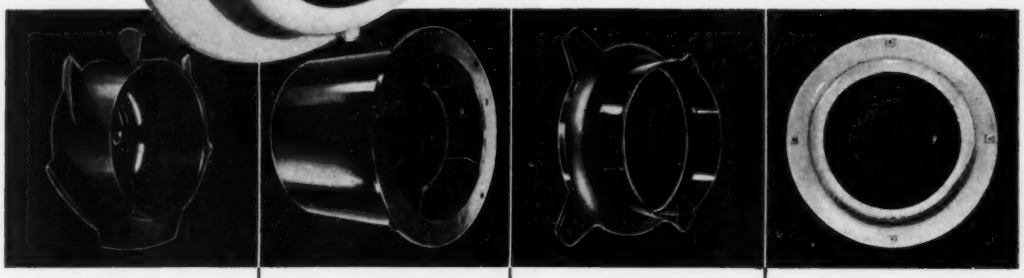
Plants at: PITTSBURGH · VANDERGRIFT · NEW CASTLE · YOUNGSTOWN · CANTON

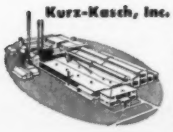
Axivane Kitchen Exhaust Fan—by Joy Mfg. Co.

A Whiz-z-z-z in PLASTICS



one | **two** | **three** | **four**

PERFORMANCE-WISE—in a class by itself! Production-wise — an almost classic plastics application! This Joy Axivane Kitchen Exhaust Fan has something to offer everybody. • It consists of a motor, a filter unit, a vast amount of ingenuity, and some 9 lbs. of plastics, Kurz-Kasch moulded. There's the rotor (**one**), *statically and dynamically balanced*. There's the casing (**two**) with moulded-in stationary vanes and motor mounting—*nearly 5 solid pounds of it*. There's the big plunger-moulded flared intake (**three**), engineered as a press-fit support member. They're *all* phenolic material. Then, there's the urea bezel retainer ring (**four**), 15" in diameter. Assembled, you get the only vane-axial exhaust fan on the market—quiet, non-turbulent, highly efficient and easily installed—effective not only in kitchens, but wherever volumes range from 250 cfm to 400 cfm at pressures not exceeding 0.8" w.g. • Why plastics? It's fire-resistant, acid-resistant and weather-proof. It's light for easier mounting. It's attractive cost-wise. And after months of tests, its dimensional stability has been pronounced noteworthy. • Why Kurz-Kasch? We've built our reputation on jobs like this for over well over 30 years. Jobs that we're proud of, from good design to on-time delivery. Call us and we'll do the same for you.



Kurz-Kasch, Inc. • 1415 South Broadway • Dayton 1, Ohio

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PRE-PLASTICIZING PRESS*
COLORS . . . COMPOUNDS

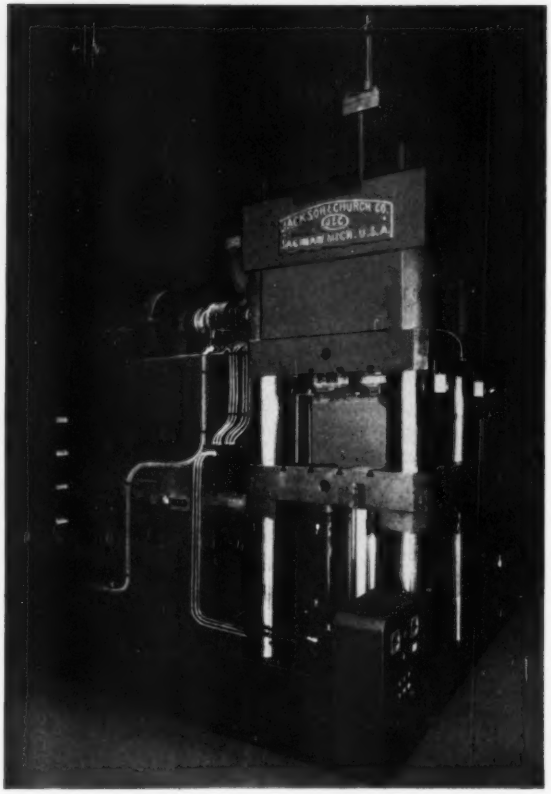
PLASTICIZING INDEPENDENT OF INJECTION CHAMBER

MINUTELY CONTROLLED INJECTION SPEED

COLORS AND COMPOUNDS WHILE MOLDING

30 SECOND CYCLES WITH MAX. OZ. AND MAX. STROKE

AVAILABLE IN 8, 24, 48, 64 AND 80 OZ. MODELS



SPECIFICATIONS — 48 OZ. MODEL

Ounces Per Shot	48 oz. (Styrene)
Time Cycle for 48 Oz.	30 Seconds
Total Poundage Per Hour	360 Lbs. (Styrene)
Pressure Per Square Inch on Material in Injection Chamber	10,000 p.s.i. Maximum
Diameter of Plunger	3¼" Diameter
Diameter of Screw	3¼" Diameter
Speed of Screw	25 to 200 r.p.m.
Projected Area	500 Square Inches
Locking Pressure	500 Tons 573 Actual
Stroke of Clamp Cylinder	27 Min. 36 Maximum
Speed of Closing	350 Inches Per Minute Slowed Down to 60 Inches Per Min. for Clamping
Speed of Opening	425 Inches Per Minute Slow Down for Knock-Out
Maximum Overall Height	19'6" to 21'
Maximum Daylight Opening	36" to 64"
Minimum Daylight Opening	0" to 37"
Distance Between Tie Rods	Left to Right 36 Inches Front to Back 36 Inches
Floor Space Required	96 Square Feet
Approximate Weight	60,000 Pounds

AVAILABLE IN 8, 24, 48, 64, AND 80-OZ. MODELS

500 SQUARE INCHES PROJECTED AREA AND 360 LBS. PER HOUR ON 48 OUNCE PRESS

*Patents Applied For

POLYSTYRENE, ACRYLIC, ETHYCEL AND VINYLITE

LARGE PROJECTED AREA

The sensationally new J-C Press . . . operates under tremendously lower injection pressures . . . with a ratio of 1 ton clamp to each square inch of projected area—as opposed to from 2 to 3 tons clamp per square inch on conventional machines. This makes possible larger and better moldings (500 sq. in. on the 48 oz. machine) . . . and multiple cavity molds at lower injection pressures—in faster cycles—and on a production basis.

MOLDING CLEAR ACRYLIC

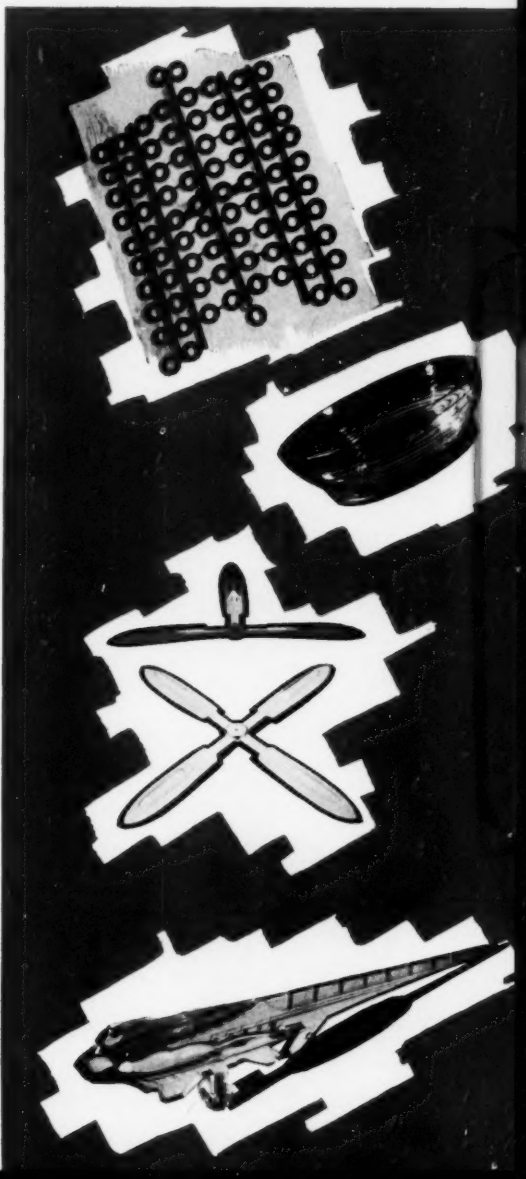
Molding clear acrylic . . . as well as coloring is easy on the J-C Preplasticizing Press. Its complete mulling and preplasticizing means better, more strain free parts . . . finely detailed moldings . . . and more rapid cycles. Minute control of injection speeds and amazing low pressures, are added features.

HEAVY SECTION MOLDING

Heavy section molding of either styrene or acrylic . . . in fast cycles . . . is handled in an efficient manner on this versatile press. The finely adjustable ram control insures dense, bubble-free parts of fine dimensional stability.

COMPOUNDING ETHYCEL

The J-C Press compounds and colors ethycel acetate and vinylite and then injection molds it in one continuous operation. The Press operation is very simple . . . the specially built pre-plasticizer does three jobs: 1.—it heats, 2.—it completely mulls, compounds, colors and uniformly plasticizes, 3.—it feeds the molding compound directly into the vertical *torpedo-less* injection chamber in exact one-shot doses . . . all automatically.



A PRODUCT OF

J-C JACKSON & CHURCH CO.

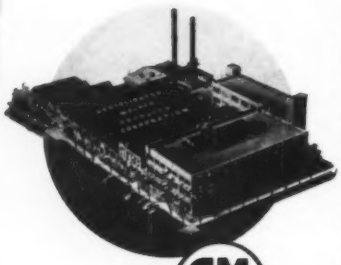
SAGINAW, MICHIGAN

WORK WELL DONE SINCE '81

*One of a Series of Messages to the Buyer of Custom Molded Plastics

"S.Q.C."...

this Consolidated *tool* makes your plastics parts live-up to their specifications!



Statistical Quality Control—referred to as one of "the sharpest management tools developed in half a century"—is in full operation here, at Consolidated. With it, we bring to our production quality an ability to make the molded part . . . and its counter*parts* conform to the specifications set down for it by the product manufacturer. The method, by far, represents today's most economical control. It eliminates double inspection—reduces rejects—and raises the standards of an entire output.

The system, one of scientific sampling, is documented by regular timings, gauge readings, jig constructions, graph plottings. In the hands of Consolidated's skilled plastics technicians, "S.Q.C." can't help but insure you the kind of plastics production that makes for a strong custom-molding relationship.

Whenever you are projecting a part—to be molded of plastic—and one that must toe the specifications line—call in a Consolidated sales engineer. Any one of our quickly reached offices is ready to apply experience, know-how and savings to your custom plastics problem.

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This is Consolidated . . . A Million Dollars in Custom Molding Facilities to Guarantee "Your Blueprint in Plastic" . . . with Savings!

Consolidated ***Molded Products Corporation***

Plant & Executive Offices: **309 CHERRY ST., SCRANTON 2, PA.**

Branch Offices and Representatives in **New York, Chicago, Milwaukee, Detroit, Cleveland, Bridgeport, Philadelphia—*and other principal cities***

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AND MANY OTHERS...

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LAMPSHADES
New line of delicate pastel colors
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Color clear through (not coated)
Low cost...all sizes and colors from stock
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Tough...form retentive...no fabricating problems
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PRINTING
64¢
NEW IPI inks for plate polishing...no lamination necessary
Excellent printing surface
Dimensionally stable for color registration
Lower cost
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Uniform in gauge and clarity
Full range of thicknesses, sheet areas and roll widths
Lower Cost...
New markets for transparent packaging

New type low cost Celanese sheet is the ideal replacement for inflammable nitrate and other higher cost plastic sheets.

CELANESE SHEET GIVES YOU continuous lengths in several standard widths . . . less blanking-out waste and faster production . . . available in clear and colored transparents, translucents, opaques and shells—in thicknesses from 0.003" to 0.250".

PERMANENT INVENTORY OF STOCK ITEMS

To give fabricators the benefits of lowest possible cost and prompt service on shipments, an extensive inventory is maintained of sheet and rolls in stock colors and gauges. It is estimated that this unique inventory method will meet the requirements of about 90% of all sheet applications.

If you are now using plastic sheet of any type, don't fail to investigate the *possibilities* of this new Celanese product. We are prepared to supply you with a list of sizes, gauges, colors, and prices, and helpful information on adapting Celanese sheet to your special requirements.

Write Celanese Corporation of America, Plastics Division, Dept. 1-C, 180 Madison Avenue, New York 16, N. Y.

Celanese* PLASTICS

*Reg. U. S. Pat. Off.

PROTECT
your vinyl plastics AGAINST BOTH LIGHT AND HEAT ...with these "Dutch Boy" Stabilizers

"DUTCH BOY" DYPHOS

Dibasic Lead Phosphite. The outstanding heat and light stabilizer for vinyl chloride polymers and copolymers. Dyphos is unexcelled in providing protection against the deleterious effects of *both* heat and light.

The remarkable effectiveness of Dyphos makes it possible to utilize chloroparaffins as low cost flame-resistant secondary plasticizers in quality products. Dyphos is also highly effective in plastisols and organosols.

TRADE NAME	CHEMICAL COMPOSITION	RECOMMENDED FOR USE IN
"Dutch Boy" Tribase	Tribasic Lead Sulphate	Electrical compounds
"Dutch Boy" Tribase E	Basic Lead Silicate Sulphate Complex	Low volume cost insulation
"Dutch Boy" DS-207	Dibasic Lead Stearate	Sheeting, extrusion and molded compounds, i.e., insulated wire and vinyl phonograph records
"Dutch Boy" Plumb-O-Sil A	Coprecipitate of Lead Orthosilicate and Silica Gel	Translucent and colored sheeting and upholstery stocks
"Dutch Boy" Plumb-O-Sil B	Coprecipitate of Lead Orthosilicate and Silica Gel	Translucent film and sheeting, belting
"Dutch Boy" Plumb-O-Sil B Electrical Grade	Coprecipitate of Lead Orthosilicate and Silica Gel	High grade insulated wire and sheeting
"Dutch Boy" Dythal	Dibasic Lead Phthalate	General purpose stabilizer for heat and light
"Dutch Boy" Dyphos	Dibasic Lead Phosphite	Excellent for heat and light in all opaque stocks including Plastisols and Organosols
"Dutch Boy" Normasal	Normal Lead Salicylate	Vinyl flooring compounds. Rubber stocks as non-scorch activator

"DUTCH BOY" TRIBASE
Tribasic Lead Sulphate plus
"DUTCH BOY" DS-207
Dibasic Lead Stearate

The popular combination for good, all-around performance. Combines heat stability, light fastness and lubricity in processing.

"DUTCH BOY" DYTHAL

Dibasic Lead Phthalate. An excellent absorber of ultra-violet light, Dythal promotes light fastness in organic films. This advantage, combined with rugged heat stability derived from the basic character of this compound, makes Dythal the *general purpose stabilizer.*

Accelerated tests in the laboratory, plus outdoor exposure tests, show that Dyphos, Dythal, and Tribase—DS-207 greatly increase the useful life of plastic compounds.

For example, a compound containing Dyphos withstood over 2000 hours in the Weatherometer before failure.

"Dutch Boy" Stabilizers are a product of National Lead Company.

Our technical staff will help you stabilize vinyl resins for any use. Write for complete information.

Dutch Boy PRODUCTS

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Dutch Boy

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NATIONAL LEAD COMPANY

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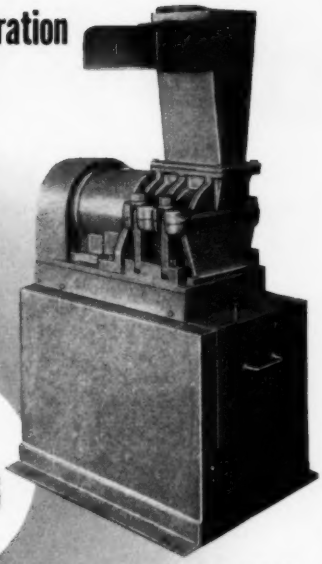
There's a model designed for *your* method of operation

HIGHLY EFFICIENT
EASY TO CLEAN
RUGGED



Cumberland
PLASTICS GRANULATING MACHINES

DIRECT COUPLED
(Model 1/2 Illustrated)
FOR CENTRAL GRINDING

Used primarily when scrap material is transported to a central area for the granulating operation. Capacity is large in proportion to size of machine. Available in Models 0, 1/2, 1-1/2, and 18.

V-BELT DRIVEN
(Model 1/2 Illustrated)
FOR USE BESIDE EACH INJECTION MOLDING MACHINE

Saves handling costs. Prevents contamination of material. Occupies less floor space. Material container is built-in. Available in Models 0 and 1/2 only.

For complete information, request Bulletin 250.

CUMBERLAND **CUMBERLAND** **CUMBERLAND**

ROTARY CHOPPING MACHINE

Heavy duty, rugged machine. Used for cutting thick vinylite slabs from two roll mills. Also used as large capacity pelletizer. Other applications are described in Bulletin 400.

GRANULATING MACHINE MODEL 18

Large capacity. Double hung construction. Easy to inspect, dismantle, and adjust. Further details are in Bulletin 250.

PELLETIZING MACHINE

Smaller, companion model to Rotary Chopper. Designed specifically for use with continuous extruders. Request Bulletin 500.

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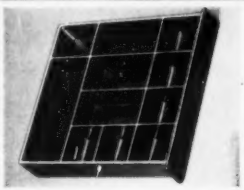
HOW TO CHOOSE YOUR
IMPACT GRADE
PHENOLIC MOLDING COMPOUND

What do you make?		Properties you need	DURITE recommends
Reels, bobbins and other machine parts.		Smooth finish, toughness, dimensional stability.	For highest strength: 532 For high and medium strength: 541, 530 Black or brown.
Compass and gauge housings, other instruments housings.		Lustrous finish, high impact, dimensional stability and good moldability.	For general use: 530, 537 Black or brown.
Cash drawers, other store fixture parts to stand hard usage.		High impact strength, excellent finish.	For general use, low cost: 530, 537, 560 Black or brown.
Gun grips and other military equipment.		Highest impact, good finish, uniform density.	CFI-20 type: 532 CFI-10 type: 541 Black or natural.
Appliance plugs and other household equipment to stand hard usage.		Good finish, resistance to heat conduction, adequate dielectric strength. Low cost.	For general use: 509, 533 For highest strength: 577 Black or brown.

For products that have to "stand the gaff", molders turn to DURITE, specialists in phenolics for General Purpose, Heat Resistance, Electrical Resistance, Impact Resistance—and made-to-order modifications of standard materials embodying special characteristics to meet your specific requirements. Address:

THE BORDEN COMPANY · CHEMICAL DIVISION
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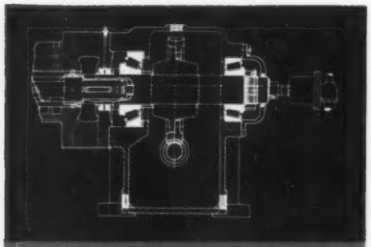
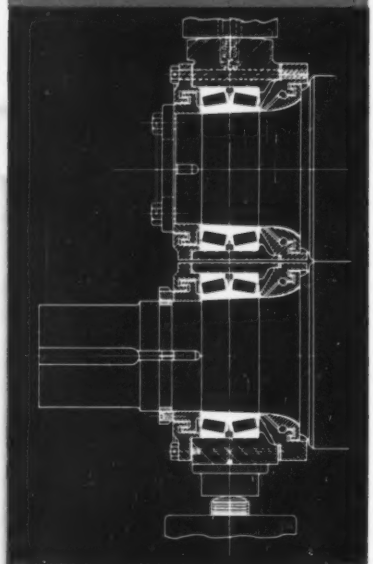
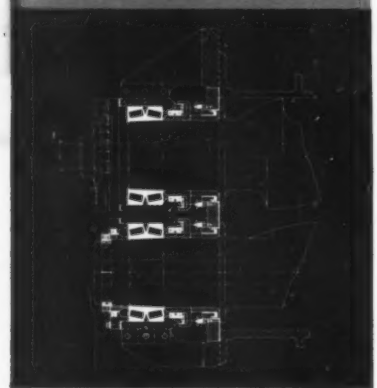
Molding Powders · Bonding Resins · Cements



Timken bearing applications in extruders.



Timken bearing application for roll necks of mills.



Timken bearing applications in mixer.

HOW TO MAKE YOUR PLASTICS EQUIPMENT DO MORE WORK WITH LESS PLAY . . . . . .

Your plastics processing equipment will do its job more efficiently and last longer when every rotating shaft is mounted on Timken tapered roller bearings.

Timken tapered bearings hold shafts in true alignment, keep gears meshing smoothly. Due to their tapered construction, Timken bearings take any combination of radial and thrust loads. Special thrust bearings or washers are unnecessary. Design can be simplified — space saved.

Timken bearings are manufactured to extreme precision. Their true rolling motion practically eliminates friction in moving parts. Line contact between the rolls and races provides maximum load-carrying capacity.

Made of the finest steel ever developed for tapered roller bearings — Timken fine alloy steel — Timken bearings last the life of the machine in which they are used.

No other bearing can bring you *all* the advantages you get with Timken bearings — backed by fifty years of research and development. Make them standard in all the machinery you buy or build. And look for the trade-mark "TIMKEN" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address "TIMROSCO".

TIMKEN
TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ▯ AND THRUST →▯← LOADS OR ANY COMBINATION

Marvinol's extra toughness and dryness make plastics products more durable and pleasant to touch.

Superior dimensional stability makes Marvinol ideal in products that must not shrink.

In products that must resist chemical and abrasive action, Marvinol fortifies against oils, acids, wear, tear.

NEW THINGS IN PLASTICS

...faster, better with *Marvinol*® vinyl resin

Marvinol's superior flexibility in low temperatures pays off in products subjected to severe exposure and cold weather.

If your product is one of these basic plastic shapes . . . one made from them, or even one that has possibilities for manufacturing from plastics, you'll find production time-savings and extra quality in using Marvinol vinyl resin. To improve your product test this remarkable vinyl polymer.

SEE WHAT *Marvinol* OFFERS YOU

Processors find Marvinol a big time-saver because of its shorter pre-mix, open mill and Banbury cycles.

Extruders of wire products, tubing, belting and other continuous cross-sectional shapes benefit from Marvinol's faster extrusion.

Marvinol may be extruded, calendered, injection molded, made into dispersions for casting film, spreading on fabric and slush molding.

Field engineers and customer research laboratories provide helpful technical service to Marvinol vinyl resin users.

IF YOU USE PLASTICS in any form, send for details about Marvinol. Naugatuck Chemical makes and sells Marvinol vinyl resins only as raw materials, but we will be glad to refer you to one of our customers for additional information on Marvinol. Write Dept. M-3, NAUGATUCK CHEMICAL, 501 E. Preston St., Baltimore 2, Md.

Marvinol

NAUGATUCK CHEMICAL

DIVISION OF UNITED STATES RUBBER COMPANY

OTHER PRODUCTS OF NAUGATUCK CHEMICAL: Latex • Dispersions • Reclaimed Rubber Plastics • Synthetic Rubber • Rubber Chemicals • Agricultural Chemicals • Aromatics.

Buyer preference for your finished plastic product depends on many factors—an important one being your choice of the proper plasticizer.

Through continuing research Pfizer has developed a group of plasticizers from citric acid which have a combination of many desirable performance characteristics and which may solve your special problems. The citrate plasticizers in this group offer special advantages to you because of the versatility of the citric acid molecule, which contains one hydroxyl and three carboxyl groups and offers possibilities for tailor-made plasticizers. Among them are several which have proved particularly successful with cellulose acetate, vinyl and other resins.

Write our Technical Service Department regarding your plasticizer problems. Samples and technical information will gladly be supplied, and are worth your investigation. Chas. Pfizer & Co., Inc., 630 Flushing Ave., Brooklyn 6, N. Y.; 425 N. Michigan Ave., Chicago 11, Ill.; 605 Third Street, San Francisco 7, Calif.

PFIZER

Manufacturing Chemists for over 100 years.

PFIZER QUALITY ®

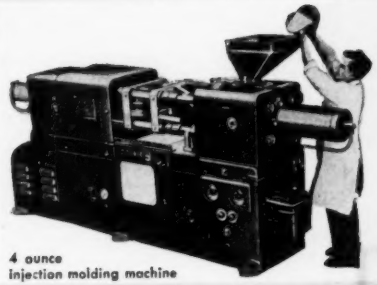
WINDSOR *Hi-Production* INJECTION MOLDING MACHINES

— top-notch molding performance

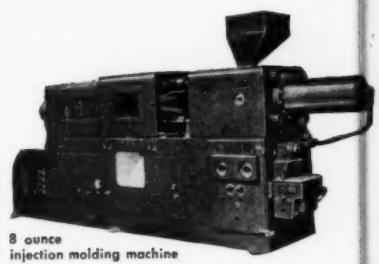
Fine injection molding machines by R. H. Windsor Ltd.—manufacturer of the world famous L.M.P. double-screw compounder-extruder — come in a complete capacity range for molding thermoplastic items of almost every size and shape.

To deliver suitable amounts of clamping and injection pressure, each Windsor injection molding machine is equipped with a balanced hydraulic system. In the smaller sizes, the machines have manual cycle controls; the larger capacity units feature fully automatic cycling, with provisions for manual control if desired.

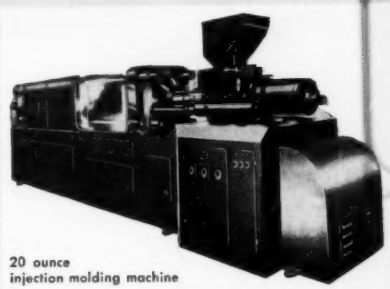
Toggles, pressure plates, injection cylinders and plungers, tailstocks, tie bars and other parts which undergo pressure are made of high grade steel castings or of hard chromed alloy steels to prevent distortion or warpage. The fast even plasticization of the machines lowers molding costs. All Windsor machines are constructed for simplified maintenance and fast mold changing.



4 ounce
injection molding machine



8 ounce
injection molding machine



20 ounce
injection molding machine

also available in 1, 2, 3, 6, 12 and 16 ounce capacities

natural companions to any molding press

WINDSOR *Precision-Made*

INJECTION MOLDS

R. H. Windsor's position as one of the world's leading mold builders is your guarantee of skill and precision workmanship. Design and construction of your molds by Windsor craftsmen insures the appearance and performance of your finished products.

Windsor-made molds take full advantage of the capabilities of your molding machine and the material you will use. Accurately machined to the tolerance required, they are polished to perfection to produce moldings with flaw-free surfaces.

Windsor is equipped to produce your injection molds from sketches, models, blueprints, or plans with utmost efficiency and precision. To facilitate estimates, complete details should be forwarded promptly.

PLASTIC MACHINES

WRITE FOR DESCRIPTIVE LITERATURE

R. H. Windsor Ltd.

16 Finsbury Sq. London, E.C.2 England

MANUFACTURERS UNDER L.M.P. PATENTS

R. H. Windsor, Ltd. is exclusive manufacturer of the world-famous L.M.P. double-screw compounder-extruder for the British Empire, the United States and South America (excluding Brazil).

How to make planned assembly savings pay off

ASSEMBLY COSTS CUT 60% Refresh-Aire Corp. directly compared fastening costs in assembly of this Ozonizer—found other methods would cost over twice as much as the simpler P-K Fastening method. P-K Type F Screws fasten the light and tube sockets as shown, and also fasten the grill and back panel to the plastic case. This manufacturer wisely planned assembly economy by choosing Self-tapping Screws; insured these savings by specifying P-K.

Don't let screw failure cancel savings

TYPE F
(Also made with Phillips head)

Three steps are needed to *insure* assembly savings. First, engineer your assembly for minimum cost. Next, select the simplest, speediest fastening method. Then, if as in most cases, you find this to be with Self-tapping Screws, use the best that money can buy. For, if screws run offsize, if they break or otherwise fail, all your carefully *planned* savings are lost.

Choose P-K* Screws ... avoid slowdowns and scrapped parts

Parker-Kalon, originators of Self-tapping Screws, learned long ago how to keep hardness and toughness properly balanced in *every* screw—learned to maintain the uniform quality that keeps assembly humming. And there's no substitute for 35 years experience.

Remember, the actual cost of screws depends, never on price, *always* on performance. Specify Parker-Kalon, and you'll see why the makers of thousands of the nation's best known products say—IF IT'S P-K . . . IT'S O. K.!

Parker-Kalon Corporation, 200 Varick St., New York 14, N.Y.
Sold everywhere through accredited Distributors.

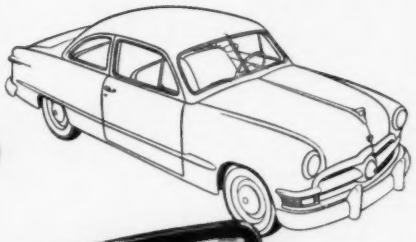
NEED SPECIAL SMALL SIZE PHILLIPS HEAD SCREWS?
P-K Type A or Z, in No. 0 or 00 diameter, with a No. 0 Phillips Recess, can be made to order, quantity permitting.

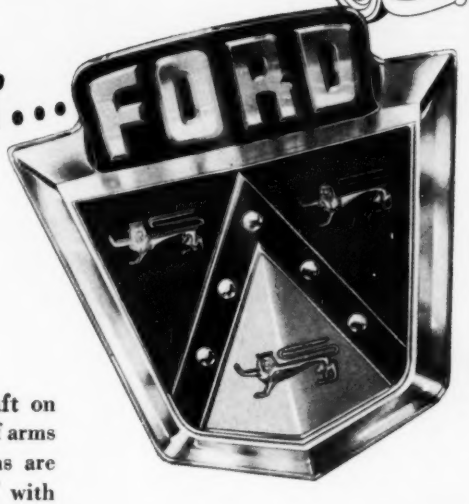
*TRADE MARKS REG. U. S. PAT. OFF.

P-K TRADE MARK

The Original
PARKER-KALON* SELF-TAPPING SCREWS
A TYPE AND SIZE FOR EVERY METAL AND PLASTIC ASSEMBLY

...New...for '50 PLEXIGLAS Crests for... FORD





PLEXIGLAS crests ride fore and aft on Ford's new cars for 1950. First coat of arms mounted by Ford, the new emblems are molded of transparent PLEXIGLAS V with metallic inlay applied on back of the finished molding. The design, molded in intaglio, stands out so realistically that it appears to be embedded in the sparkling plastic.

Molders: Gits Molding Corporation, 4600 W. Huron Street, Chicago. Hoosier Cardinal Corporation, Evansville, Ind.

PLEXIGLAS V injection molding powder combines *all* the traditional advantages of acrylic plastics —plus exceptional ease of molding. PLEXIGLAS V products have lustrous beauty, great dimensional stability, high heat distortion temperature, and outstanding resistance to age and weather.

More and more PLEXIGLAS V is going into automotive appointments and decorations. Steering wheel medallions, lenses, radiator ornaments, radio panels, escutcheons, and a score of other long-lived parts are being molded from this sparkling acrylic powder. For products of lasting beauty, get the complete story of PLEXIGLAS V today. Our nearest office will be glad to discuss your molding problems—or if you prefer, get in touch with us direct.

CHEMICALS FOR INDUSTRY

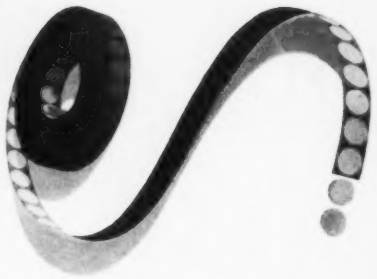
ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries

PLEXIGLAS *is a trade-mark, Reg. U. S. Pat. Off. and in principal foreign countries.*
Canadian Distributor: *Crystal Glass & Plastics, Ltd., 282 St. Helens Avenue, Toronto, Ont.*

informative labeling in action...



START WITH THIS 'conveyer-belt' roll of Kum-Kleen pressure-sensitive Labels mounted on special backing tape for instant removability.

ADD A KUM-KLEEN automatic dispenser that delivers individual labels to the hand of the operator, ready for instant application without moistening.

THE RESULT, in the eyes of Mrs. America, is a labeled product that tells and sells its material, its uses, its advantages. *(By the Plas-Tex Corp.)*

TIME WAS when costly informative labeling was strictly for $5-and-up articles.

Today you see informative labels by Kum-Kleen everywhere—even on variety-store articles!

The explanation is simple.

Kum-Kleen pressure-sensitive Labels are applied with production-line speed at a fraction of the on-the-product cost of ordinary labels. They stick and stay stuck to all plastics, without heat or moistening...yet are removable by the consumer without harmful scraping or tearing.

Whether you want to name names—as The Plas-Tex Corporation does with its *Styron* products—or simply emphasize product features, Kum-Kleen is *the* informative label for plastics.

When you think of informative labeling in action, think of Kum-Kleen. Write today for Kum-Kleen facts and samples.

Kum-Kleen®

AVERY ADHESIVE LABEL CORPORATION
Monrovia, California

NEW YORK · PHILADELPHIA · DETROIT · CHICAGO · CLEVELAND · AND ALL PRINCIPAL CITIES

Cabinet molded for Zenith Radio Corp., Chicago

Skillful Molding Creates

ITS NEWEST CABINET MEMBER

This cabinet which we molded for Zenith's new "Tip Top Holiday" portable is the latest in a long line of plastic cabinets molded by Mills. In shape—size—color—these cabinets have varied as widely as the products for which they were made.

All were alike however in one respect. Each was engineered and molded so that its attractive, sales appealing appearance was matched by sturdy durability.

The fact that we received additional cabinet molding jobs as well as other molding orders from the same clients proves we can be depended upon for top quality every time.

Let us show you today how our unique combination of sound engineering—*careful, correct* material selection and skillful molding can create a better plastic product for you.

Write on your letterhead for the new Injection Molded and Extruded Plastics Catalog. Or, for detailed information about [redacted] piping, tubing and fittings, write for circulars containing data and illustrations.*

**Trademark registered*

ELMER E. MILLS CORPORATION

INJECTION MOLDERS and EXTRUDERS of: Tenite, Lumarith, Plastacele, Fibestos, Lucite, Nylon, Plexiglas, Polystyrene, Styron, Loalin, Vinylite, Geon, Plexene, Polyethylene, Cerex, Forticel, [redacted]*, Saran, and other Thermoplastic Materials.

2930 NORTH ASHLAND AVENUE • CHICAGO 13, ILLINOIS

MORE *Admiral* TV CABINETS

Coming on the double

FROM THIS MPc MONSTER PRESS

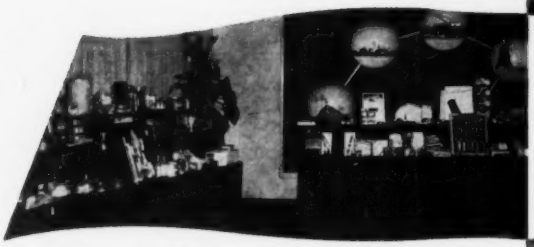
A television-hungry public is clamoring for more and more of these Admiral sets. At **MPc,** a three-shift, double-barreled production schedule is helping Admiral keep abreast of the demand. Every 5 minutes around the clock *two complete cabinets,* each weighing 18½ lb., come off this huge press.

Plastics helped Admiral achieve pace-making popularity…with modern styling, sleek finish and rock-bottom economy. And **MPc** has made plastics perform to Admiral's specifications…with large scale tool-room and molding equipment, plus imaginative engineering skill and production sagacity. Submit *your* plastics product or problem to MOLDED PRODUCTS CORPORATION, 4535 W. Harrison St., Chicago 24, Illinois.

MOLDED MPc PRODUCTS CORPORATION

5 EXTRAS for you in MONSANTO'S Merchandizing Program

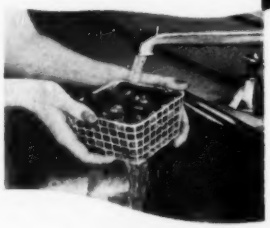
As many as 4000 retail stores . . . department, chain, variety, and specialty . . . tie in several times a year with Monsanto's seasonal promotions. They ask for and use Monsanto's colorful point-of-sale promotional material merchandising housewares, toys, picnic items.



Monsanto's First Plastics Premium Show in New York aroused so much interest around the premium industry, in February it was moved to Chicago. Several hundred buyers inspected more than 1,000 displayed products, placed orders for many of them with Monsanto's customers.

Key retail buying executives, brought to Monsanto's plant from time to time, learn at first hand about plastics and the many retail products made from Monsanto materials.

Thousands of items made by Monsanto customers get editorial notice in leading magazines, newspapers and trade papers, through the publicity activities of Monsanto's trained staff.



Customer's products are spotlighted in traveling exhibits and frequent special displays. Pictured is one of Monsanto's many mobile display units.

If you are not now using Monsanto plastics, it will pay you to investigate their many advantages. Use the coupon for information on how Monsanto plastics can help you—and how you can participate in Monsanto's merchandising program.

MONSANTO
CHEMICALS – PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

MONSANTO CHEMICAL COMPANY, Plastics Division, Dept. MPLP27
Springfield 2, Mass

☐ Please send me "What Monsanto Plastics Can Do For You."
☐ Please tell me how to participate in Monsanto's merchandising.

Name & Title _____

Company _____

Address _____

City, Zone, State _____

PLASTICS MACHINERY BULLETIN

Reporting News and Machine Design Developments

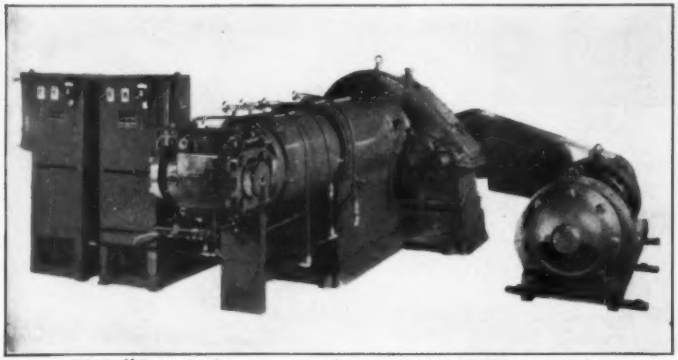
IN BUSINESS TO **NRM** REDUCE YOUR COSTS

8" EXTRUDER TYPICAL OF NRM's WIDE RANGE

Available both electrically or oil heated

NRM can furnish you exactly what you want in plastics extrusion equipment . . . everything from the 1" Bench Model extruder which serves so well as a laboratory pilot plant to the 8" extruder shown below and larger sizes for special applications.

The 8" extruder is a 600-800 lb. capacity "workhorse". NRM furnishes this machine with dual water-cooled 5" diameter capstans, complete with trough and sprays. Drive is variable speed; 100 h.p. dynamatic water-cooled coupling. Heat-treated cut steel herringbone gear transmission with oversize thrust bearing.



NRM 8" Extruder has screw speed range of 0 to 40 RPM. Accessories: crosshead for wire and cable covering up to 4" covered diameter.

Only manufacturers using NRM plastics extrusion equipment can point to *typical hourly production figures such as these:* 34 lbs. of Saran filament; 250 lbs. of film; 650 lbs. of cable covering; 1,500 lbs. of pellets.

The reasons are that only the NRM Torpedo-type screw assures maximum uniform extrusion with high temperature compounds like cellulose acetate, ethyl cellulose, polystyrene, etc. And only NRM gives you balanced heat control; a standard temperature range up to 750° F. with absolute control over frictional heat with NO COMPRESSED AIR, NO PIPES, NO WATER COOLING!

NRM *pioneered* extruders built solely for thermo-plastics extrusion—now have more than 1,000 installations in operation. It may pay you well to obtain complete information on NRM Plastics Extrusion Equipment. Write or wire for full details: H. E. Buecken, National Rubber Machinery Company, Akron 8, Ohio.

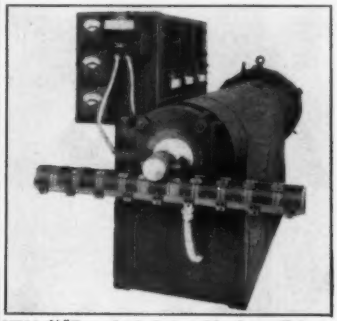
Only NRM Equipment Handles "All" Extruding

Only NRM plastics extrusion equipment can handle "all" extrusion jobs. For example, NRM builds special extruders for NYLON and SARAN. More Saran extruders have been built by NRM than by other manufacturers combined.

When you buy NRM you're buying over 12 years' creative engineering and actual manufacturing experience. Result: features exclusive with NRM —which give you more uniform extrusions with lower maintenance and production costs.

All Sizes Film Dies Available Adaptable for All NRM Extruders

NRM is serving the plastics industry all over the world with a full line of extrusion equipment designed to meet the most exacting requirements in thin-wall film and thin-gauge expanded tubing production.

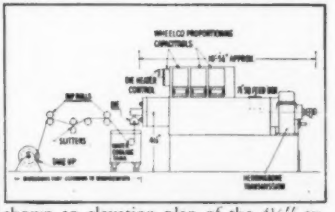


NRM 4½" Extruder is designed for fast, efficient production of high temperature materials. Capacity: up to 300 lbs. per hour.

Shown above is the NRM 4½" All-Electric Extruder equipped with T-type polyethylene die for the extrusion of 40" wide film. All sizes of dies are now available for polyethylene film .0015" to .010" thick (40" to 72" sheet width); all dies are readily adaptable for NRM extruders. In addition, NRM engineers will work with you to furnish sheeting dies to individual specifications.

FILM TAKE-UPS IN TWO SIZES

NRM now makes sheeting take-ups available in two sizes—48" and 72". Below is



shown an elevation plan of the 4½" extruder and take-up. This is typical installation and shows the water cooling tank, nip rolls and take-up.

NATIONAL RUBBER MACHINERY CO.

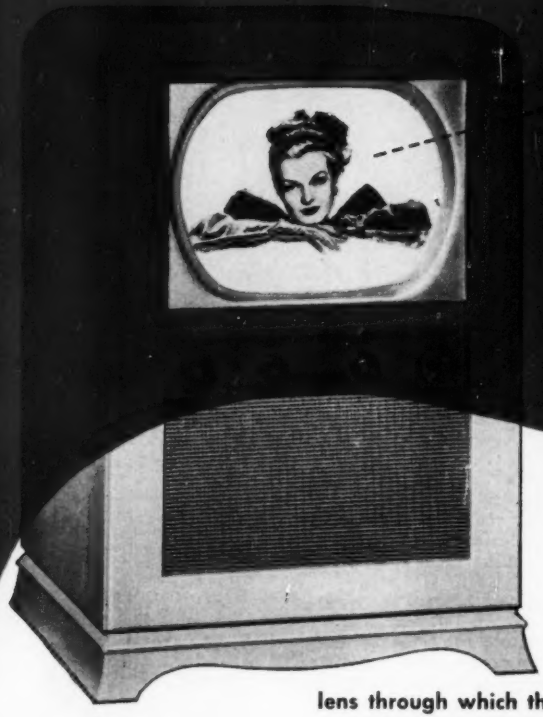
General Offices & Engineering Laboratories
Akron 8, Ohio

PLANTS at Akron and Columbiana, Ohio and Clifton, N. J.
AGENTS East: National Rubber Machinery Co., Clifton, N. J.
West: S. M. Kipp, Box 441, Pasadena 18, Calif.
EXPORT Plastics Machinery: OMNI EXPORT CORPORATION
460 4th Ave., New York 16, N. Y.

Creative Engineering

Packard-Bell

TELEVISION "SEES" through SWEDLOW



Again Swedlow skill in Acrylics serves still another field of science...and merchandising! Its latest achievement is the optically accurate and, from a *selling* standpoint, most attractive protective lens through which the beautifully clear, sharp pictures of Packard-Bell television are projected to the viewer.

Produced in one piece, precision-engineered for perfect optical properties, and opaqued in gold to form the frame around the image, this Swedlow product for the West's largest manufacturer of fine television sets is another instance of Swedlow's expanding usefulness to American industry.

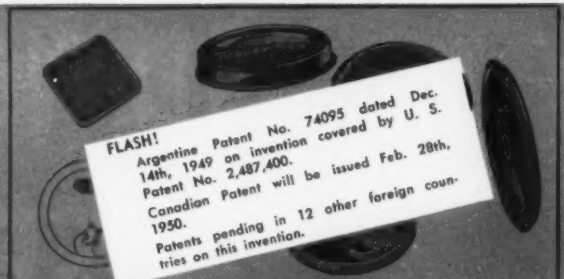
Our engineering division will be glad to cooperate with manufacturers in the development of fabricated acrylic parts for their products, from tiny precision sections to 60 square foot aircraft enclosures.

Write, wire or phone—

Swedlow PLASTICS CO.

3757 WILSHIRE BOULEVARD • LOS ANGELES 5, CALIFORNIA

Tupper Seal, air and liquid tight flexible covers fit, and are included in the sets of all Tupperware Canisters.



FLASH!
Argentine Patent No. 74095 dated Dec. 14th, 1949 on invention covered by U. S. Patent No. 2,487,400.
Canadian Patent will be issued Feb. 28th, 1950.
Patents pending in 12 other foreign countries on this invention.

TUPPER / Seals

air and liquid-tight, flexible covers for Tupperware Tumblers, Canisters, Wonder Bowls, Cereal Bowls and many another container of glass, metal and pottery, the contents of which it is desired to keep fresh and wholesome.

TUPPER /

There's a Tupper Seal, air and liquid-tight flexible cover for Tupperware 3, 5, 8 and 12½ oz. Tumblers too, and these Tupper Seal, covers fit many other containers of metal, glass and crockery.

The Tupper Seal, air and liquid-tight flexible Pour Top cover, specially designed as a dispensing cover for specified diameters of containers holding foods such as syrups, salad dressings, catsup.

The Tupperware 50 oz. Canister is "standard equipped" with the Tupper Seal, air and liquid-tight flexible Pour All cover.

The Tupper Seal, air and liquid-tight flexible Pour All cover is used on every Tupperware 20 oz. Canister.

The cover of the Tupperware Bread Server which serves as a bread tray also is designed to give similar results as Tupper Seal, air and liquid-tight Flexible covers. Keeps contents fresh as no other such container.

The Tupper Seal, air and liquid-tight, Pour All cover as a cover for 46 oz. cans; Tupperware Sauce Dishes and other containers of metal, glass or pottery. Foods easily dispensed without removing entire cover.

When equipped with Tupper Seal, air and liquid-tight, flexible covers, Tupperware Cereal Bowls serve many another purpose.

The Tupperware Wonder Bowls are usually fitted with Tupper Seal, air and liquid-tight covers.

The Tupper Seal, air and liquid-tight flexible cover made for Tupperware 8 oz. Tumblers also fits and is sold with all Tupperware Funnels as a base when funnels are used as storage containers.

FORMAL NOTICE! 9th November, 1949

EXCLUSIVE!

U. S. Patent #2,487,400

The Tupper Corporation has attained a position of leadership in this industry by incurring great expense and expending painstaking effort in the development, design, manufacture and exploitation of its many world-known products.

The Tupper Corporation further has anticipated the inevitable attacks to which leadership is subject and has taken measures provided by law to preserve the creative rights to its products, methods and design by patent protection both in the United States and abroad.

Tupper Seals for Tupperware shown in this advertisement are just a few of the forms covered in this manner and are specifically covered by U.S. Patent #2,487,400.

Only the Tupper Corporation, by U.S.Patent #2,487,400 has the right to make, use and vend container closures in connection with any and all types of containers throughout the United States and its territories as covered by the claims of the Patent.

Tupper Corporation will protect, according to law, the exclusive rights above granted

TUPPER CORPORATION

TUPPER CORPORATION

Manufacturers of — CONSUMER, INDUSTRIAL, PACKAGING AND SCIENTIFIC PRODUCTS

FACTORIES: Farnumsville, Mass., and Cuero, Texas New York Show Rooms 225 Fifth Ave.

ADDRESS ALL COMMUNICATIONS TO: Department D

COPYRIGHT TUPPER CORPORATION 1949

Save up to 5¢ a pound

with the JAMISON SYSTEM for coloring polystyrene

No Weighing! No Fussing! Foolproof!

Here's the first word about the unique JAMISON SYSTEM that enables you to color your own polystyrene as you need it . . . in every color you require . . . at savings up to 5¢ per pound . . . and without the necessity for stocking large quantities of costly pre-colored materials.

More than that, the JAMISON SYSTEM requires no skilled labor. Just one man can tend as many as *four* JAMISON Dry Mixers and color as much as 2400 pounds of polystyrene per hour!

The two basic features of the JAMISON SYSTEM are

1) the specially compounded JAMISON Color Mixes, which are delivered to you in individual, moisture-proof unit packages, each carefully pre-measured and pre-milled to color exactly 100 pounds of clear polystyrene crystal, and
2) the JAMISON Dry Mixer, where the mixing takes place — at the rate of 100 pounds of clear polystyrene plus one package of JAMISON Color Mix every 10 to 20 minutes.

All Colors Available

You can get a complete selection of standard transparent and opaque Color Mixes as well as mahogany and black for use in coloring scrap material. In addition, special colors can be compounded to match your samples.

Investigate Today

Find out all about the JAMISON Dry Coloring System and the money it can save you. Ask for full details now.

Just 4 Easy Steps . . .

One Dump two 50-pound bags of clear polystyrene in your JAMISON Dry Mixer (shown above).

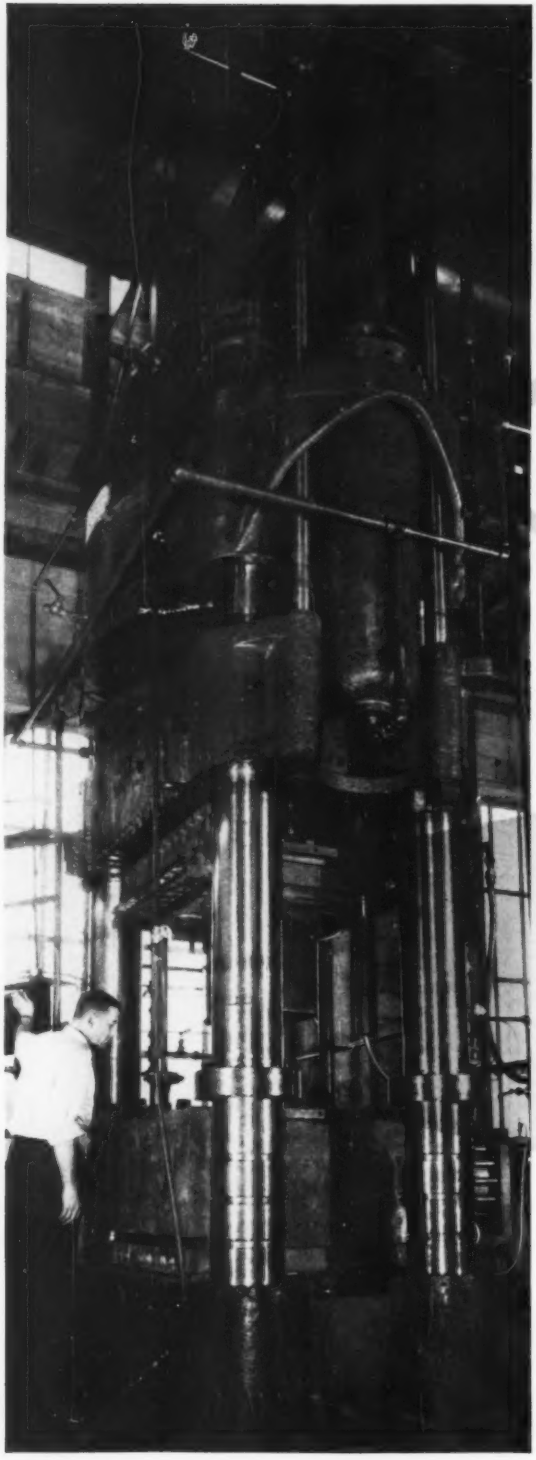
Two Add one bag of the appropriate JAMISON Color Mix.

Three The automatic timer on the Mixer is pre-set . . . just press the starter button.

Four When Mixer stops, simply empty the completely colored polystyrene . . . It's ready for molding!

H. JAMISON PLASTICS

11 West 42nd Street, New York, N. Y. • Plant: Freeport, L. I., N. Y.



As one plastics publication editor expressed it

For some years a limited number of large piece jobs has been produced, and a few companies have led in specializing on this work. The same companies lead in the present movement toward still larger piece molding.

New Markets Demand Larger Pieces

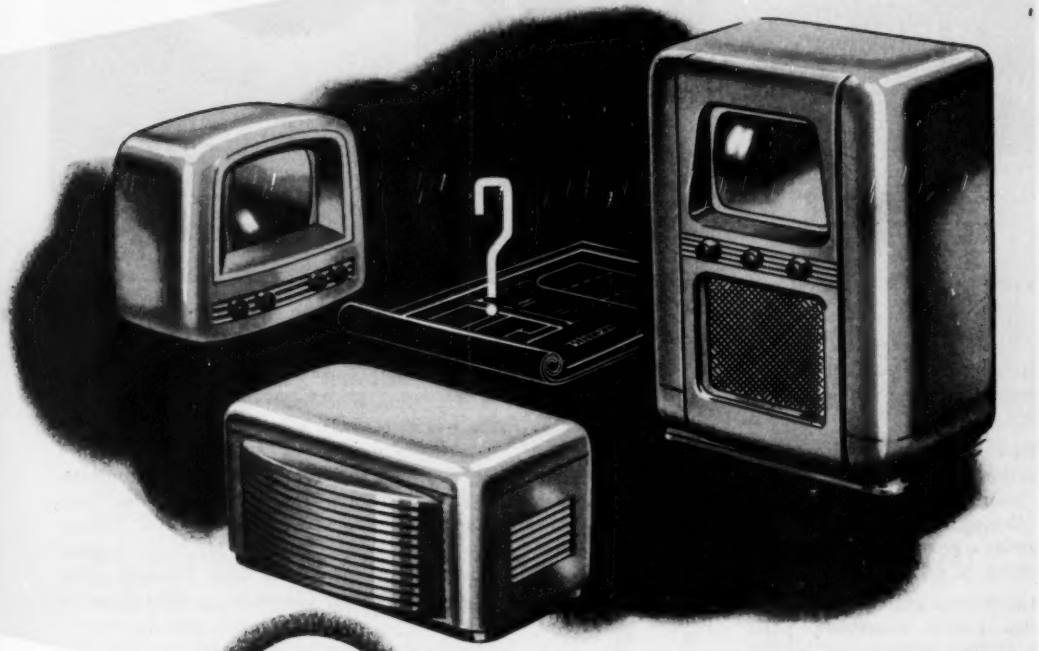
AND WE LIKE 'EM *Big!*

The bigger they are, the better we like 'em at General Industries. Molded plastic air conditioner cabinets . . . molded plastic television cabinets . . . *or molded plastic what have you* . . . the only limit on size at General Industries is that of the press itself . . . and that 1850-ton "baby" on the opposite page is one of the largest in the industry.

Already, extensive production of various television cabinets on our large press equipment has proved the practicability and amazing economy of tough, modern plastics for large unit pieces.

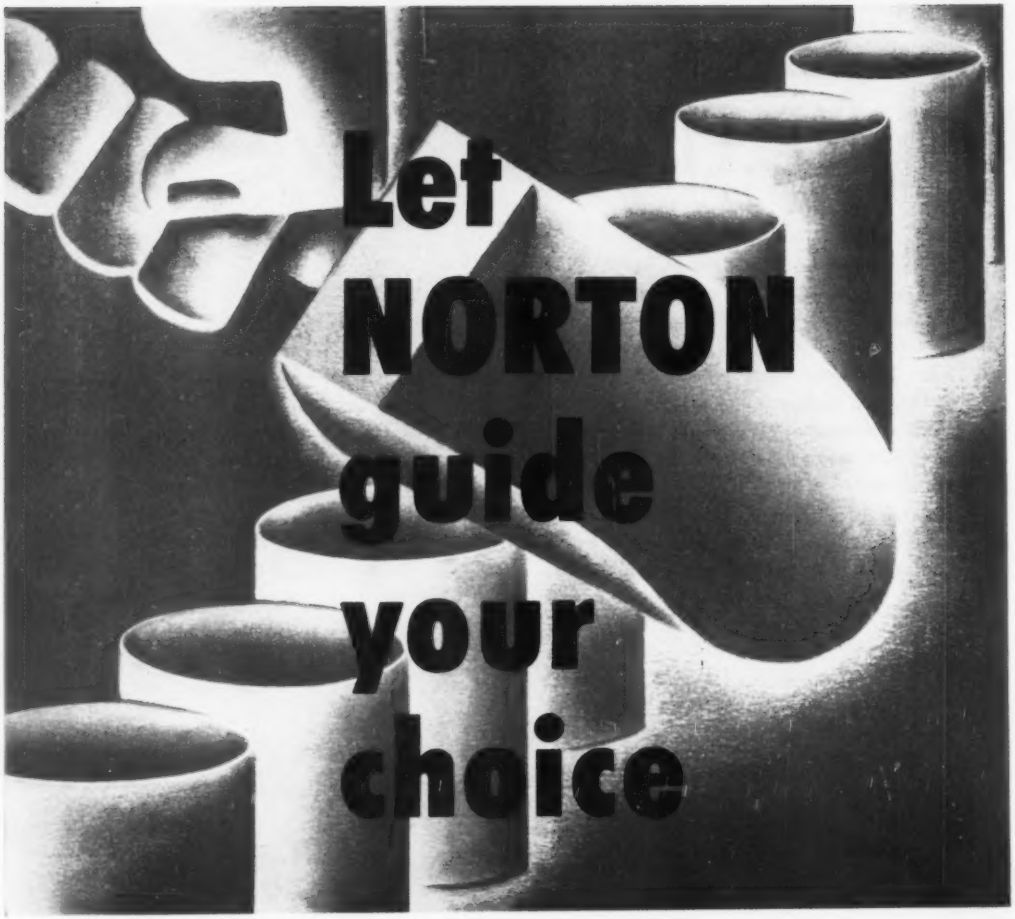
Perhaps you have a design—or maybe it's just an idea—of a product that can be made better, more attractive, *at lower cost* in colorful, practical plastic. If so, General Industries would like to show you how its quarter-century of molding experience, engineering know-how and unsurpassed facilities can turn that design or idea into an eye-appealing, fast-moving sales item.

Write, wire or phone *today*.



The GENERAL INDUSTRIES Co.

DEPARTMENT R • ELYRIA, OHIO



Thermoplastic or thermoset? Styrene or acetate? Urea or phenolic?

Who shall guide you to a sound selection of the plastic material for your product? The engineers at Norton Laboratories, one of America's great names in custom molding, of course.

The Norton engineers who help design plastic assemblies, parts and finished products for leaders in American industry *know how*.

The Norton men who tend the injection and compression presses *know how*.

Norton's guidance, Norton's design skill, Norton's presses are yours . . . if you need plastic moldings designed and molded by men who *know how*.

Put Norton designers to work now, without obligation on your part, on the preliminary spade work for your next molding assignment. Write to us describing the job—we will respond promptly with design recommendations, price estimates and delivery dates.

Or, if you prefer, ask our sales offices to have a Norton *engineer* to call on you for a free consultation. Norton Laboratories, Inc., Lockport, N. Y. Sales Offices: *New York — 347 Fifth Avenue; Chicago — 5221 Kimbark Avenue; Cleveland — 4504 Superior Avenue.*

NORTON *Laboratories, Inc.*

COMPRESSION AND INJECTION MOLDING

You'll be interested in this 80% SAVING in Production Costs

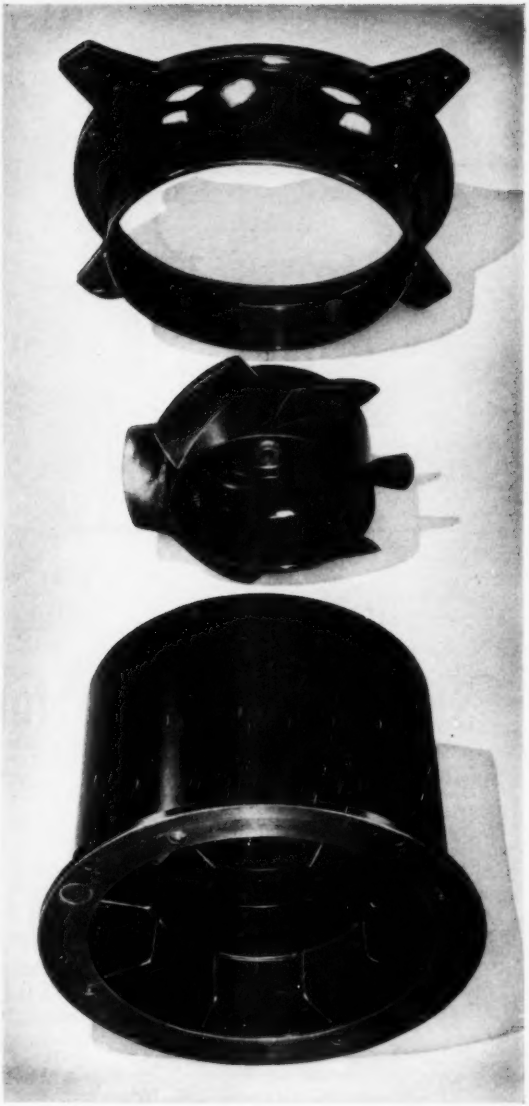
Switching from a cast metal to BAKELITE Phenolic Plastics for the housing, rotor, and flared intake of their "Axivane" fan, Joy Manufacturing Company slashed production costs of the parts by 80%!

As if the 80% savings were not enough, Joy Manufacturing Company reports these additional advantages:

The parts, molded by Kurz-Kasch, Inc., are light in weight with excellent moisture, chemical and electrical resistance. Their attractive, noncorrodible finish has given the fans more competitive sales advantages—clearly demonstrated by increased sales volume in old as well as new markets.

It's another striking example of the way that BAKELITE Phenolic molding materials, available for a wide variety of purposes, have upgraded many products and parts, both large and small, in practically every industry.

With 40 years of experience as a leading producer of phenolic molding materials, Bakelite is in a pre-eminent position to advise you on how they can improve your products and lower their costs. Your inquiry will be promptly and confidentially handled. Write Dept. AA 13.



Visit the National Plastics Exposition, Navy Pier, Chicago, March 28-31

Bakelite TRADE-MARK Phenolic PLASTICS

BAKELITE DIVISION UCC

BAKELITE DIVISION, *Union Carbide and Carbon Corporation*, 30 East 42nd Street, New York 17, N. Y.

Sure-fire Formula for Increasing Sales!

PLASTIC CHILDREN'S RECORDS molded by Columbia for Plastic Art Toy Corporation of America — are creating a sensation. Included with each set of famous "Little Homemaker" miniature furniture, these records have put a vertical line on the Plasco sales chart.

Columbia injection molding solved the problem of fast and inexpensive mass production. And, what's so amazing, these plastic "platters" not only give fine tonal reproduction and extraordinary fidelity, but their durability will stand the cuffing of the most rambunctious youngsters!

You, too can discover the profit behind this sure-fire formula for more sales: Your product plus Columbia's vision, experience, and unsurpassed facilities!

Whatever your plastic problem . . . from one of molding to one of economical mass production, or the design of a package or product with unique sell appeal . . . Columbia can do the job better!

Why not send for our representative now?

Columbia

COLUMBIA PROTEKTOSITE CO., INC., CARLSTADT, N. J.

New York Showrooms: Empire State Bldg. • West Coast Office: 380 Bayshore Blvd., San Francisco, Calif.

For Complete Satisfaction

SPECIFY VARCUM PHENOLICS

● It's true that the word "satisfaction" means a lot of different things to a lot of different people. But when it comes to phenolic resins, three vital factors add up to Satisfaction for *you:*

1. A source of supply that is dependable and cooperative.
2. Resins that are formulated to your exact requirements.
3. Delivery that is prompt and a price that is competitive.

Naturally we're not *perfect,* but we *are* meeting the most exacting requirements of many leading manufacturers . . . and of companies who rapidly are becoming leaders.

These companies have expressed their *Complete Satisfaction* by regularly specifying VARCUM phenolics for use in their products. This list has been growing steadily through the years. If your company has not yet investigated the advantages of VARCUM resins, let us help *you* with your next phenolic problem!

VARCUM CHEMICAL CORPORATION

NIAGARA FALLS, NEW YORK

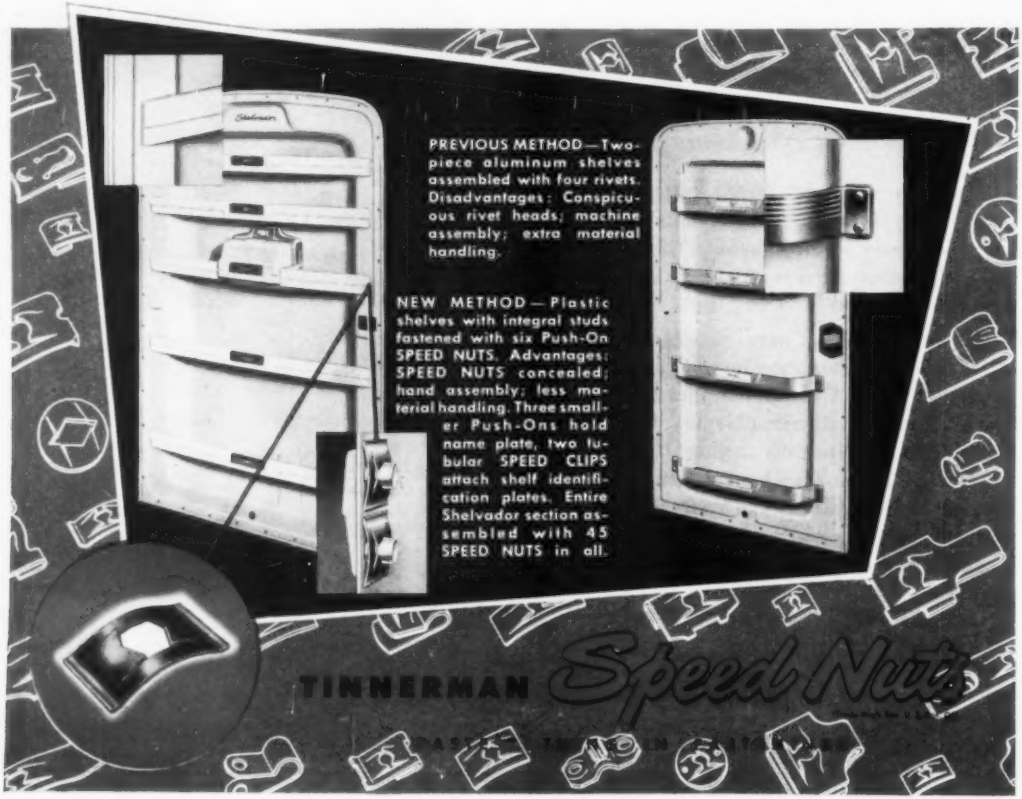
How ~~CROSLEY~~ "Traded-In" *Speed Nut Savings for* Better Shelvador® Design

The 1950 Shelvador has been dressed up for even greater "buy-appeal" in 1950.

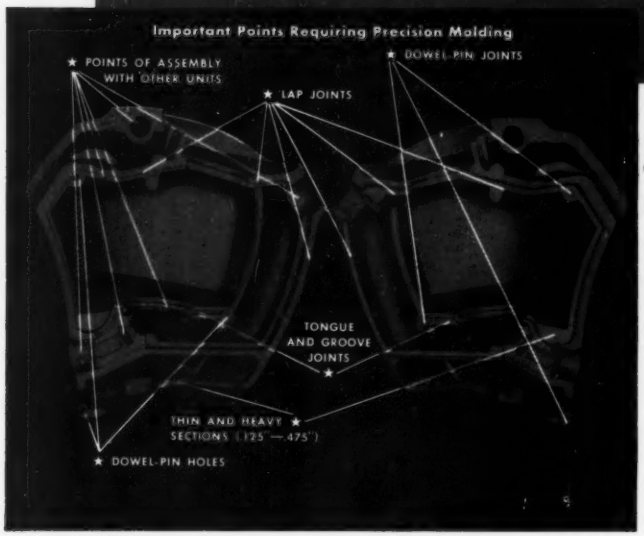
Crosley Division of AVCO Manufacturing Corporation has replaced riveted aluminum shelves with streamlined, gleaming plastic attached with Push-On SPEED NUTS—at no extra cost!

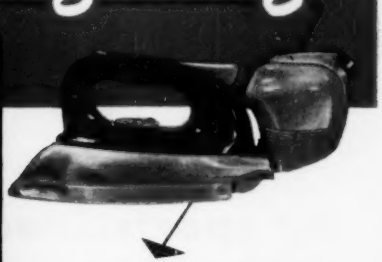
The assembly is now done by hand rather than machine, and the higher unit cost of the improved shelves is completely offset by a *49 percent SPEED NUT savings.*

You, too, can capitalize on savings from SPEED NUT brand fasteners. Ask your Tinnerman representative for details. Also write for booklet, "SPEED NUT Savings Stories". Tinnerman Products, Inc., 2040 Fulton Road, Cleveland 13, O. In Canada: Dominion Fasteners Limited, Hamilton.


PREVIOUS METHOD—Two-piece aluminum shelves assembled with four rivets. Disadvantages: Conspicuous rivet heads; machine assembly; extra material handling.
NEW METHOD—Plastic shelves with integral studs fastened with six Push-On SPEED NUTS. Advantages: SPEED NUTS concealed; hand assembly; less material handling. Three smaller Push-Ons hold name plate, two tubular SPEED CLIPS attach shelf identification plates. Entire Shelvador section assembled with 45 SPEED NUTS in all.
TINNERMAN
Speed Nut

NEW PROCTOR STEAM IRON
is tops in plastic engineering





Intricate design perfectly molded using

KOPPERS POLYSTYRENE 8

At left are pictured the two halves of the water reservoir for the New Proctor Steam Iron showing the details of its outstanding plastic engineering design. *Product* designed by Proctor Electric Company's Engineering Staff, Philadelphia, Pa. in conjunction with Donald E. Dailey, Industrial Designer. *Mold* designed by Proctor Electric Company's Engineering Staff in conjunction with Shaw Insulator Co., Irvington, N. J., molders of the parts.

● The water reservoir for the new Proctor Steam Iron is an unusually skillful accomplishment in plastic engineering. It shows the ingenuity of the designer, the skill of the mold maker and the application of a superior polystyrene.

This application required not one or two but *eight* special properties—

1. Excellent moldability
2. Ease of flow
3. Low shrinkage
4. Dimensional stability
5. Resistance to heat distortion
6. Light weight
7. Low water absorption
8. Translucence combined with color

Koppers Polystyrene 8 meets all the requirements with the added advantage of low cost.

The water reservoir is made in three parts—the two shown on the left plus a molded cover. Sections vary in thickness from 0.125" to 0.475". Precision molding makes possible the assembly of close fitting valve parts. Mold design, molding technique and the superior properties of Polystyrene 8 combine to assure accurate fit of tongue and groove joints, lap joints and dowel pin joints. (See illustration.) Parts can be quickly assembled and are cemented together with a specially developed Polystyrene adhesive.

WHAT IS YOUR PROBLEM IN PLASTICS?

The above example shows how one of the Koppers plastics filled the exacting requirements of one manufacturer. Our technical service representatives have worked on many such problems and their experience is at your call. Send the coupon for complete information.

KOPPERS COMPANY, INC.
Chemical Division Pittsburgh 19, Pa.
Regional Offices: New York, Boston, Chicago and San Francisco

KOPPERS

Koppers Company, Inc.
Chemical Division, Dept. MP-8
Pittsburgh 19, Pa.

Please send me data on Koppers Perfected Plastics.

Name_____

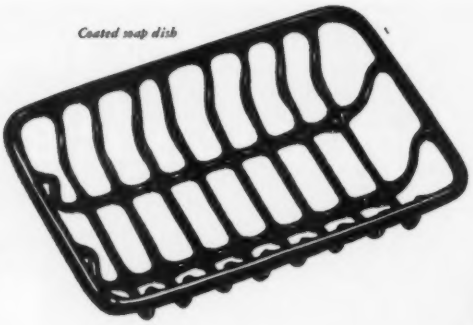
Position_____

Company_____

Address_____

Koppers *Perfected* Plastics

Dipped ping pong paddle



Coated soap dish

For sports...work...or play —just see what American Anode plastisols can do!

Coated work glove

AS these pictures show, American Anode plastisols have a wide range of profitable applications. And what's more, they can be used easily and economically.

Take Ameran resin paste, for example. It's a new American Anode plastisol—for dipping, coating or spreading. It can be used to make coatings or flexible sheets—maintaining permanent lustre. No solvents are needed—there's no fire hazard, no recovery problem. It can be compounded to give you the qualities you want—oil resistance, acid resistance, chip-proofness, full variety of fast colors, including white.

Dipped toy

MANY READY USES

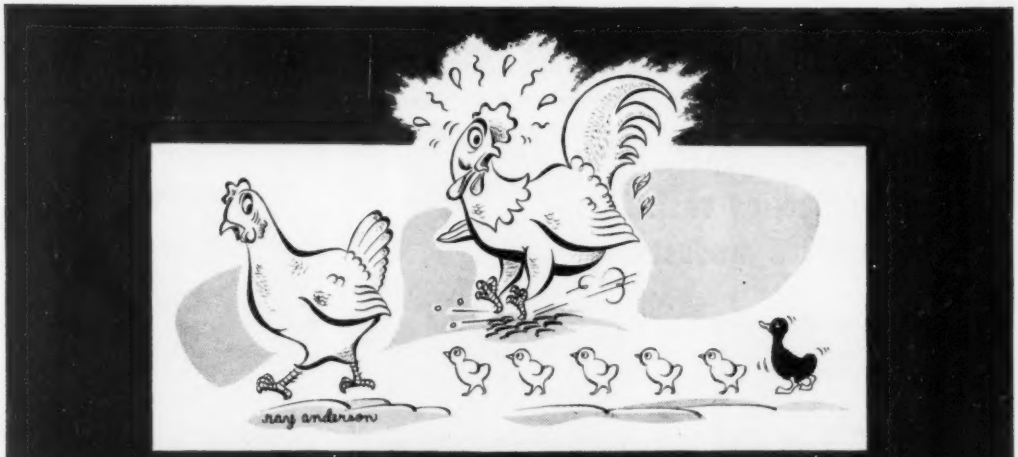
Ameran resin paste is ideal for coating metal and wire, wire baskets, plating racks, pipe linings, wood, textiles and paper. It can be used for the manufacture of unsupported films and to make dipped gloves and other applications. It's a "natural" for casting or molding finished items, such as toys, gaskets, and industrial boots. You may think of other uses.

HELPFUL TECHNICAL SERVICE

American Anode engineers will welcome your inquiries—and an opportunity to help you with your problems or products. For complete information on American Anode plastisols and profitable ways to use them, please write Department AC-2, American Anode Inc., 60 Cherry Street, Akron, Ohio.

AMERICAN ANODE

CRUDE AND AMERICAN RUBBER LATICES, WATER CEMENTS AND SUSPENSIONS, AMERAN RESIN PASTES



You can get UNIFORMITY in plastic parts

FROM PLASTIC MOLDERS, INC. (of Chicago)

Certainly we can do YOUR job, with:

- ★ Modern Tool Room
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- ★ Injection Presses from 8 oz. to 32 oz.
- ★ Fabrication, Assembly and Painting of All Types of Plastics

Representatives in Principal Cities

When You Have Plastic Molding Problems

CALL CHICAGO
PAlisade 5-6750

When plastics play an important role in your production schedule, there's no time for trouble with parts that aren't perfect. You've a right to insist on—and get—complete uniformity throughout your production schedule.

At least, that's the kind of custom molding Plastic Molders Inc., Chicago, has been doing for hundreds of manufacturers . . . and is ready to do for you.

We're equipped to do every job—large and small—with speed, efficiency and low prices—to keep your production costs in line.

You owe it to yourself to contact Plastic Molders Inc., on that very next job. An inquiry costs you nothing—may save you plenty!

PLASTIC MOLDERS, INC.
OF CHICAGO
Compression and Injection Molders
3670 Milwaukee Ave.—Chicago 41, Illinois

APPROVED MOLDED PRODUCTS

MOLDINGS UP TO 25 LBS.

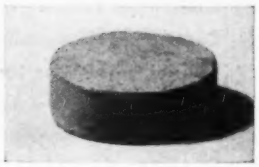
Metasap Stearates smooth the way

to increased output... lower production costs... better molded products

Testing the effect of Metasap Calcium Stearate in molding compounds at the Watertown Manufacturing Company plant, Watertown, Connecticut.

Preforms not containing Metasap Calcium Stearate require 50-lbs. of pressure in order to eject them from mold. Often they are delaminated in the ejection process, as shown below.

Preforms containing Metasap Calcium Stearate are easily released with only 10-lbs. of pressure. Delamination is thus avoided, and perfect preforms obtained (see photograph below).



Results obtained at Watertown, over a long test run, have demonstrated that preforms containing Metasap Calcium Stearate can be ejected, in perfect shape, with less than 25% of the pressure required for those that do not contain this outstanding lubricant.

Prove this for yourself . . . Simply mold two sets of similar preforms from (a) a molding compound containing Metasap Calcium Stearate, and (b) the same compound without the stearate. Determine the pressures required to eject these preforms from their respective molds, by subjecting them to precision tests on a "Plastiversal" or similar testing machine.

You'll find that preforms which contain Metasap Calcium Stearate will be ejected much more easily than those which do not.

Here's the evidence . . . that Metasap Stearates operate to effect substantial production economies all along the line . . . and assure better products, too. For lower ejection pressures provide the following important advantages:

With preforms—molding can be done with machine of less tonnage;
—delamination, due to high pressures, is avoided;
—molding materials are conserved (because of little or no preform breakage).

With finished products—output is increased (because molded pieces are quickly and easily released from molds);
—rejects are decreased (because clean-cut pieces with more marketable finish are obtained).

IN ADDITION, mold life is increased because molds are not stained, and scoring is practically eliminated.

If you employ intricate mold designs and stress high precision fabrication, you will find Metasap lubrication especially advantageous.

For complete information, write

METASAP CHEMICAL COMPANY, HARRISON, N. J.

Chicago • Boston • Richmond, Calif. • Cedartown, Ga.

METASAP CHEMICAL COMPANY — REG. U.S. PAT. OFF.

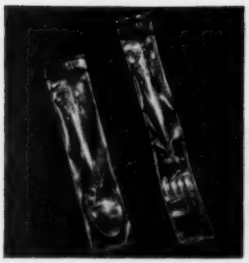
Stearates

of Calcium • Aluminum • Lead • Magnesium • Zinc

PLASTICS AT WORK AS IMPROVEMENTS

PRINTED CIRCUIT on Polyflex* polystyrene sheet made it possible for Telex to produce a hearing aid much smaller and lighter than many competitive models. Several types of polystyrene were tried. Polyflex, which is polystyrene sheet oriented in two directions for greater strength, proved most suitable for the printed circuit.

BRECK provides a 4-ounce Plaxpak polyethylene dispenser bottle with its regular 8-ounce size shampoo. Sales appeal of the Breck product is heightened by the convenience of an unbreakable, lightweight and squeezable container. Accidental slips won't result in a crash, or loss of contents.



CRAFTSMANSHIP OF WALLACE sterling is subtly presented by a diaphanous envelope of Plaxpak polyethylene film. Tarnishing and scratching are minimized, too, in store display and in the home. Bags are made by the Kage Company, Manchester, Conn.

ELECTROLYTE SOLUTION packaged separately in Plaxpak polyethylene bottles makes it possible for Koehler Manufacturing Company, Marlboro, Mass., to ship its latest Rechargeable Spotlight in a non-activated state. Purchaser receives spotlight with battery unimpaired by storage. Electrolyte is poured in when ready to use.

RESERVOIR of Plax spiral-wrapped polystyrene tubing is used in the Deaminizer, a portable, low-cost unit for demineralizing water developed by Crystal Research Laboratories, Inc., Hartford, Conn. Two pieces of heavy Plax polystyrene sheet are also used in the unit to support the tube and cup containing the chemical agent.

DEATH TO MOTHS now comes in Plaxpak polyethylene bags. The tough, tear-resistant bags permit vapor of paradichlorbenzene crystals to escape, then asphyxiate moths. Outer cellophane wrap holds vapor until bag is used. MoMort is a product of CrystalX Company, Lenni Mills, Pennsylvania.

Each of the above applications of Plax plastics products is different. But all have one thing in common — plastics have been used as improvements, not substitutes. And as improvements, these Plax materials have contributed directly to product performance and salability. In considering plastics for your product, it will pay you to keep Plax in mind as a leading source of versatile materials and as an objective guide in their use. You can get the full story on Plax by writing for our catalog.

PLAX BLOW MOLDED PRODUCTS ARE MADE UNDER THE FOLLOWING U. S. PATENTS: 2128239, 2175053, 2175054, 2230188, 2230690, 2260760, 2283751, 2349176, 2349177, 2349178. *TRADE MARK REG. U.S. PATENT OFFICE.

PLAX FOR PLASTICS

NOT SUBSTITUTES···IMPROVEMENTS

PLAX CORPORATION DIVISION, HARTFORD-EMPIRE COMPANY P. O. BOX 1019, HARTFORD 1, CONNECTICUT

In Canada, Canadian Industries, Ltd., Montreal

Offices in New York City, Syracuse, Philadelphia, Chicago and St. Louis

Scaled to Increased Sales

with "Hercules" Cellulose Acetate . . .

Models produced by Products Miniature Co., Inc., Milwaukee, Wis., with "Hercules" Cellulose Acetate Molding Powder.

Here are perfectly scaled miniatures, so realistic that their pictures might be mistaken for photos of their full-size counterparts in International Harvester Company's current line of trucks. International dealers are finding them valuable visual aids in building good will and increased sales. Molded with "Hercules" Cellulose Acetate, they reflect the quality and durability of the originals.

Miniatures of all kinds—whether they be designed as sales aids or toys—look better, work better, and have a longer service life when made with tough, colorful cellulose acetate. Ideally adapted to low-cost rapid-cycle injection molding, acetate provides the sharp, accurate detailing that makes for lifelike realism. The form retention and strength of high-acetyl acetate in lightweight, thin-wall sections spell added savings in material costs.

Why not scale *your* product to increased sales with versatile cellulose acetate. Our technical staff invites your inquiries.

ECONOMY
TOUGHNESS
MOLDABILITY
FORM RETENTION
COLORABILITY

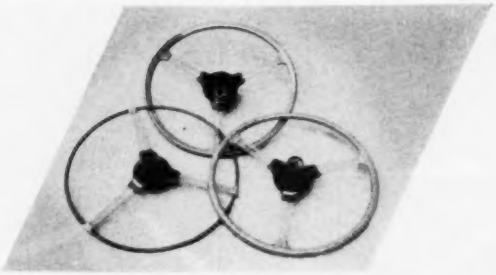
HERCULES POWDER COMPANY *916 Market St., Wilmington 99, Del.*

See the Hercules Exhibit at the 4th National Plastics Exposition, Navy Pier, Chicago, March 28-31.

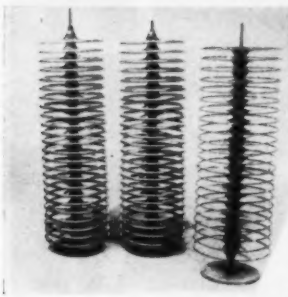
HERCULES *Cellulosic Plastics*

"HERCULES" IS REG. U. S. PAT. OFF.

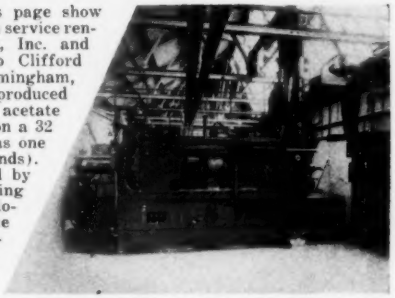
CP50-4



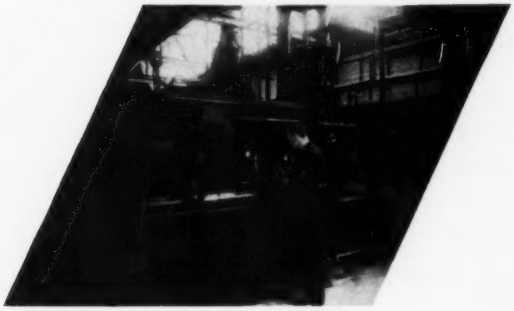
L IS FOR LATITUDE OF SERVICE



The photographs on this page show the results of the complete service rendered by Lester - Phoenix, Inc. and Lester Engineering Co. to Clifford Covering Co. Ltd. in Birmingham, England. The steering wheel produced there is molded of cellulose acetate and cellulose acetate butyrate on a 32 ounce Lester in a cycle as low as one minute (average time: 75 seconds). The complete job was engineered by Lester Engineering—even to having the molds designed and produced locally. Such typically thorough service is what makes the Lester "L" a symbol of the finest injection molding equipment, as well as complete cooperation with Lester users.



. . . . WORLD-WIDE, TOO!



Write for your free copy of the Lester Press.

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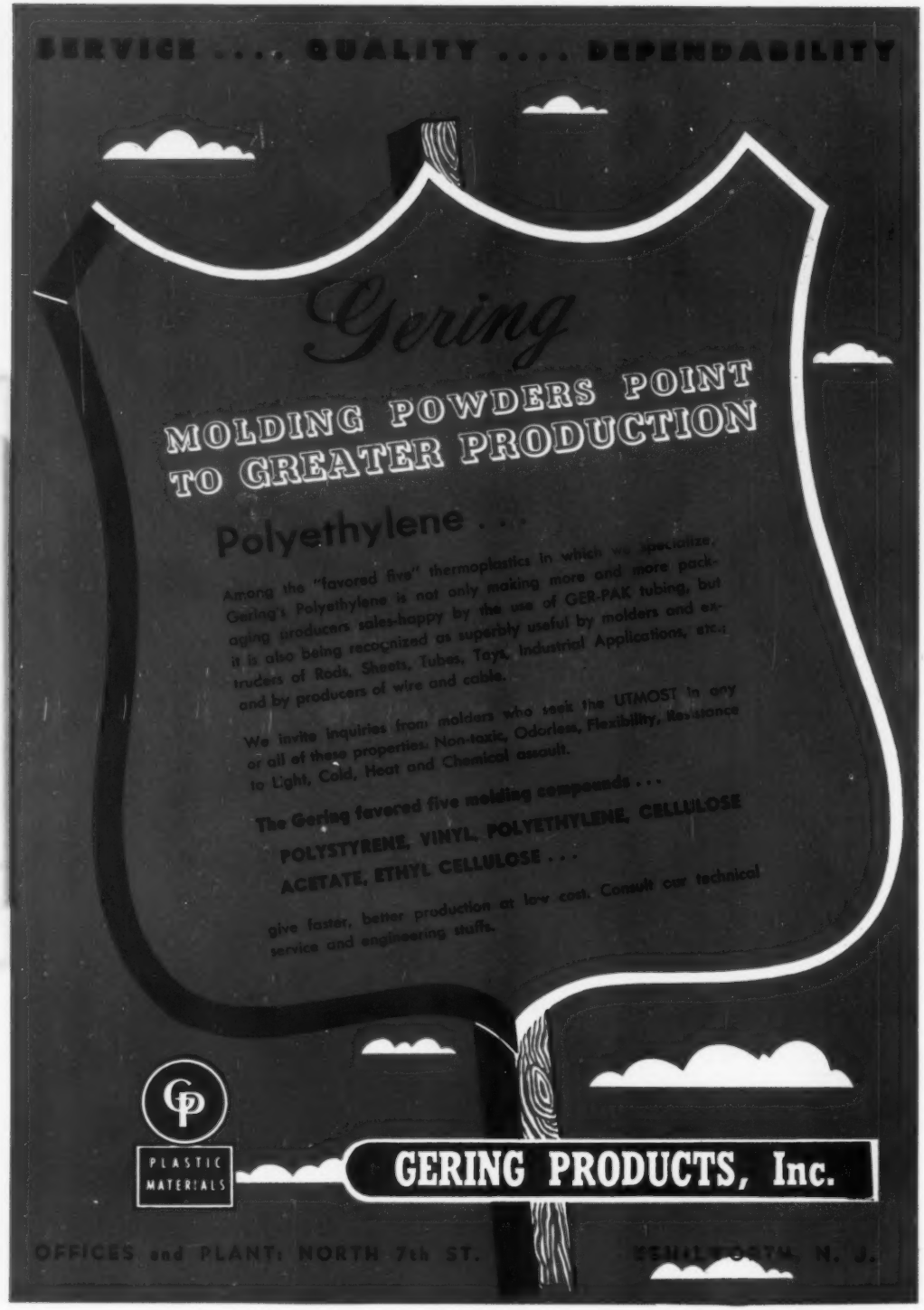
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Gering
MOLDING POWDERS POINT TO GREATER PRODUCTION
Polyethylene . . .
Among the "favored five" thermoplastics in which we specialize, Gering's Polyethylene is not only making more and more packaging producers sales-happy by the use of GER-PAK tubing, but it is also being recognized as superbly useful by molders and extruders of Rods, Sheets, Tubes, Toys, Industrial Applications, etc., and by producers of wire and cable.
We invite inquiries from molders who seek the UTMOST in any or all of these properties: Non-toxic, Odorless, Flexibility, Resistance to Light, Cold, Heat and Chemical assault.
The Gering favored five molding compounds . . .
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give faster, better production at low cost. Consult our technical service and engineering staffs.
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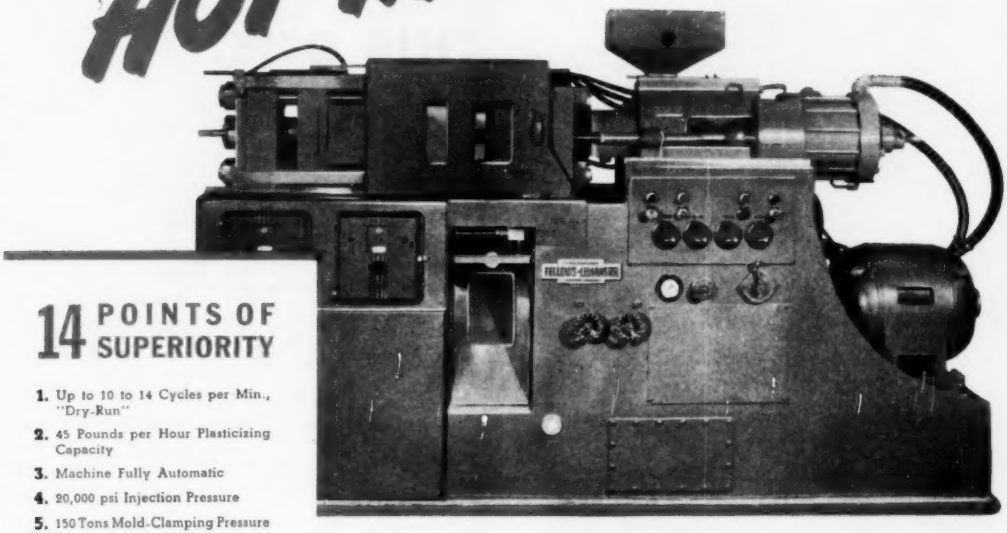
10 SHOTS PER MINUTE ON A 10-CAVITY MOLD

...that's HOT MOLDING!



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1. Up to 10 to 14 Cycles per Min., "Dry-Run"
2. 45 Pounds per Hour Plasticizing Capacity
3. Machine Fully Automatic
4. 20,000 psi Injection Pressure
5. 150 Tons Mold-Clamping Pressure
6. Rapid Advance Plunger Action, plus Adjustable Stroke
7. Water-Cooled Front Platen
8. "Speed Flo" Cylinder with Taper-Tite Separator
9. Built-in Temperature Controllers
10. Centralized Mold Clamping Adjustment
11. New Open Accessibility of Hydraulic System
12. Clock Controlled Booster
13. Air Blast Ejection provided for
14. Six-digit Production Counter

So fast is operation of this new F-L Model 1B-3 on 3-oz. production runs it is necessary to quench shots with cold running water. 6, 8 and 10 shots per minute raise production 'way UP bring cost 'way DOWN.

So fully automatic is its operation that one operator can tend three machines easily. Faster warm-up, reduced set-up time for production runs, minimized flash, open accessibility . . . all add up to a new speed cycle that means extra daily profits. Write, wire or phone the Fellows office nearest you. A new bulletin is awaiting your request.

Fellows LEOMINSTER

injection molding equipment

THE FELLOWS GEAR SHAPER CO., Plastics Machine Div.: Head Office and Export Dept., Springfield, Vermont. Branch Offices: 616 Fisher Bldg., Detroit 2. 640 West Town Office Bldg., Chicago 12 • 2206 Empire State Bldg., New York 1 • New England Distributor: Leominster Tool Co., Leominster, Mass.

EXPLORING FABRICATED PLASTICS WITH STEINER

LOOK INTO THIS ONE, PLEASE

It's a deep drawn acrylic plastic demonstrator for the *General Electric* Dish Washer.* And it's a symbol of the near-magic performed by Steiner in fabricating plastics.

We don't know what project you may be thinking of. But we do know that by ingeniously applying our fabricating know-how, we've been able to turn many a plastics day dream into a production reality.

Bring it around

Let Steiner give your idea the once over. We'll evaluate its merits; perhaps make suggestions. And we'll tell you whether or not it can be practically fabricated at a practical cost.

*Dish Washer, product of General Electric Company

Steiner

PRECISION FABRICATORS of PRODUCTS in PLASTICS

STEINER PLASTICS MFG. CO. INC.

47-30 33rd Street, Long Island City 1, N. Y.

GENERAL ELECTRIC

NEW SILICONE

Glass Molding Compound

GIVES YOU 3 OUTSTANDING PROPERTIES

CHECK THESE PROPERTIES

PROPERTY	VALUE
Heat Resistance, continuous °C	200
Heat Distortion Point at 300°C	3-5 mils
Resistance to Impact, Izod ft-lb./in. notch Length	4.38
Arc Resistance, secs.	250
Water Absorption, 48 hr. 25°C	0.07
Power Factor, 1 MC Dry	0.00173
Dielectric Constant, 1 MC Dry	3.76
Dielectric Strength, 25°C in oil S/T	185 vpm
Specific Gravity	1.71

G.E.'s new silicone molding compound is designed for high temperature applications where ordinary heat resistant compounds burst into flame. G-E 12810 can be burned by a really hot flame—but remove the fire and out go the flames. Even while smoldering, parts molded of G-E 12810 do not give off toxic fumes.

Why not investigate this new compound today. For complete technical data write to the Chemicals Division, Section D1, Chemical Department, Pittsfield, Mass.

1 **Heat Resistance** Continuous operation at 200°C (392°F) is all in a day's work for General Electric's new silicone molding compound—G-E 12810. Its inert glass filler and heat resistant silicone resin make this new compound ideal for circuit breakers, switchgear and other parts where resistance to extreme heat is a "must."

2 **Impact Strength** G-E 12810 can really take a beating! In standard Izod impact tests *minimum* values of 5 foot pounds per inch of notch length on a ½ inch notched specimen have been consistently obtained. And G-E 12810 has good flow in a mold too!

3 **Arc Resistance** G-E 12810 has outstanding arc-over and non-tracking characteristics. Regular 4" x 8" discs stand up for a *minimum* of 250 seconds using standard ASTM test procedure. And no tracking occurs when arcing does take place. G-E 12810 has other good electrical properties too.

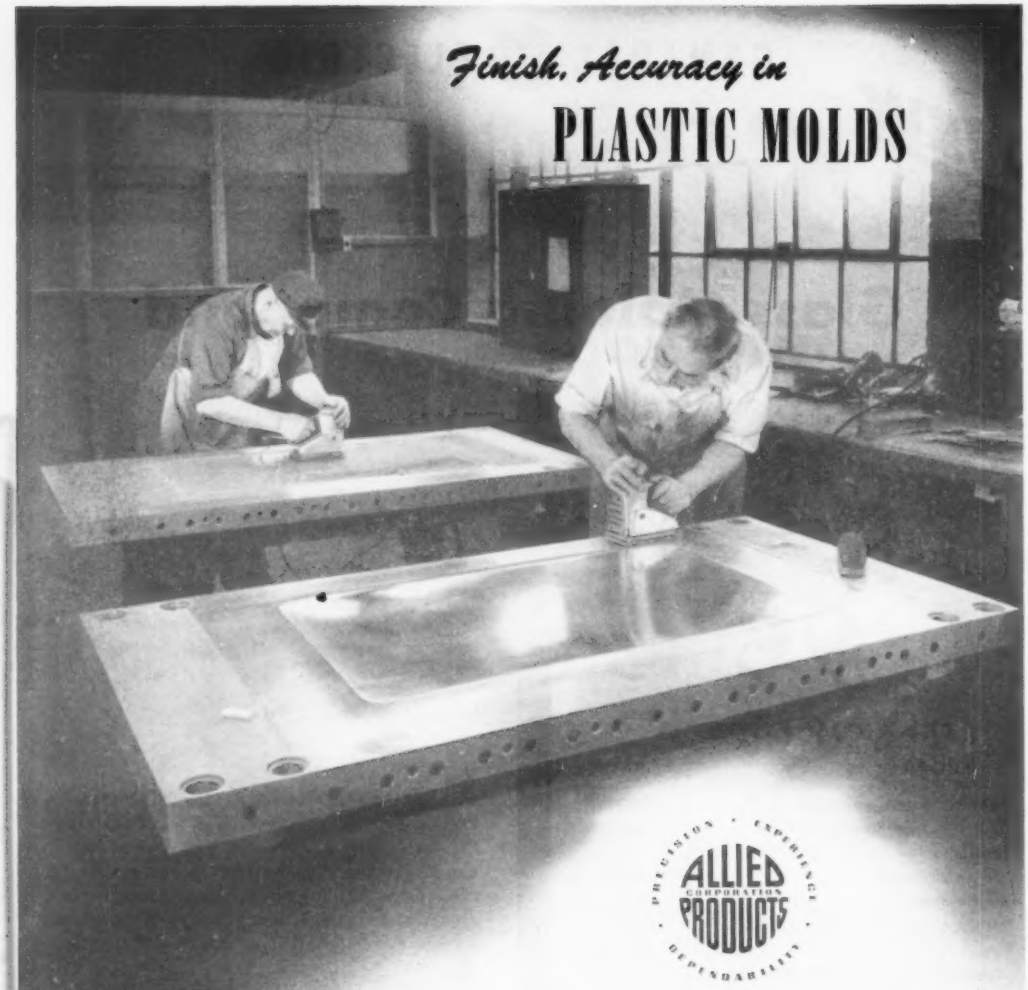
You can put your confidence in—

GENERAL ELECTRIC

CD50-D1

Finish, Accuracy in

PLASTIC MOLDS



ALLIED CORPORATION PRODUCTS — PRECISION · EXPERIENCE · DEPENDABILITY

The facilities and abilities at Allied's Richard Brothers Division for producing steam-heated plastic molds were developed with the plastics industry—are in step with the requirements of this industry today. Whether your demands for molds are "run-of-mine" or unusual . . . whether you require ordinary or 1000 grit finishes . . . whether you are looking for accuracy of form and fit that may be to the highest possible degree of mold-making precision . . . Allied can and will meet your specifications exactly. We will be glad to submit quotations to you.

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Richard Brothers Division
DEPARTMENT 3-P
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HARDENED AND PRECISION GROUND PARTS • STANDARD CAP SCREWS • SPECIAL COLD FORGED PARTS
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most plastics technicians

who know their business choose

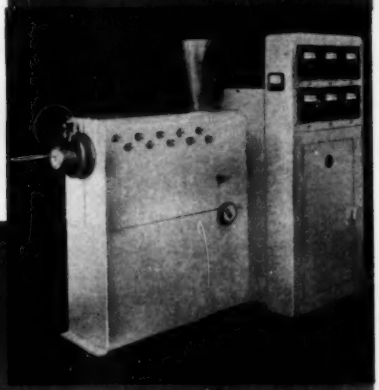
mpm EXTRUDERS

You'll be following the lead of many of the country's foremost plastics extruders when you select MPM extrusion machines and auxiliary equipment. The experience of these organizations—and of others all over the world—has conclusively proven the high output, versatility and dependability of MPM equipment in making fine extruded products.

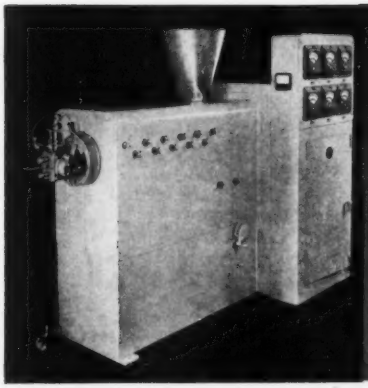
The superiority of MPM performance is no accident. It is a result of specific features (screw design, heat control, die head, etc.) which directly increase adaptability and production capacity.

Send for particulars and descriptive literature.

MPM 1½" Extruder. This machine has been installed in scores of leading material suppliers' laboratories and in plastic converters' plants. It handles a wide range of applications such as wire coating, blown film, rods, tubes, strips and the like. Materials extruded include Nylon, Ketyl, polystyrene, Acetate, methacrylate, Tenite, polyethylene, polyvinyl chloride and Formvar.



MPM 2½" Extruder. The 2½" unit will extrude up to 125 pounds of polyvinyl chloride melting hourly, for example, and up to double the capacity of other machines with methacrylate. It can be furnished with a broad range of interchangeable heads and, like all other MPM extruders, it will extrude an extremely wide selection of materials.



MPM 3½" Extruder. An extremely high production machine, the new MPM 3½" Extruder excels in covering wire, compounding and coloring resins, and in producing heavy cross sections and wide films. As much as 150 to 250 pounds per hour can be produced, depending on the materials and the application.

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We extrude whatever you want — whether it's for medical use, chemicals, electrical applications, garden hose or other purpose. Materials include Polyethylene, Nylon and all formulations of Vinyl in standard or special gauges up to 2" O. D. Yardley "Tru-Size" standard of quality insures better finish, greater uniformity, more accurate dimensions.

There's an experienced Yardley representative near you.

YARDLEY PLASTICS CO.

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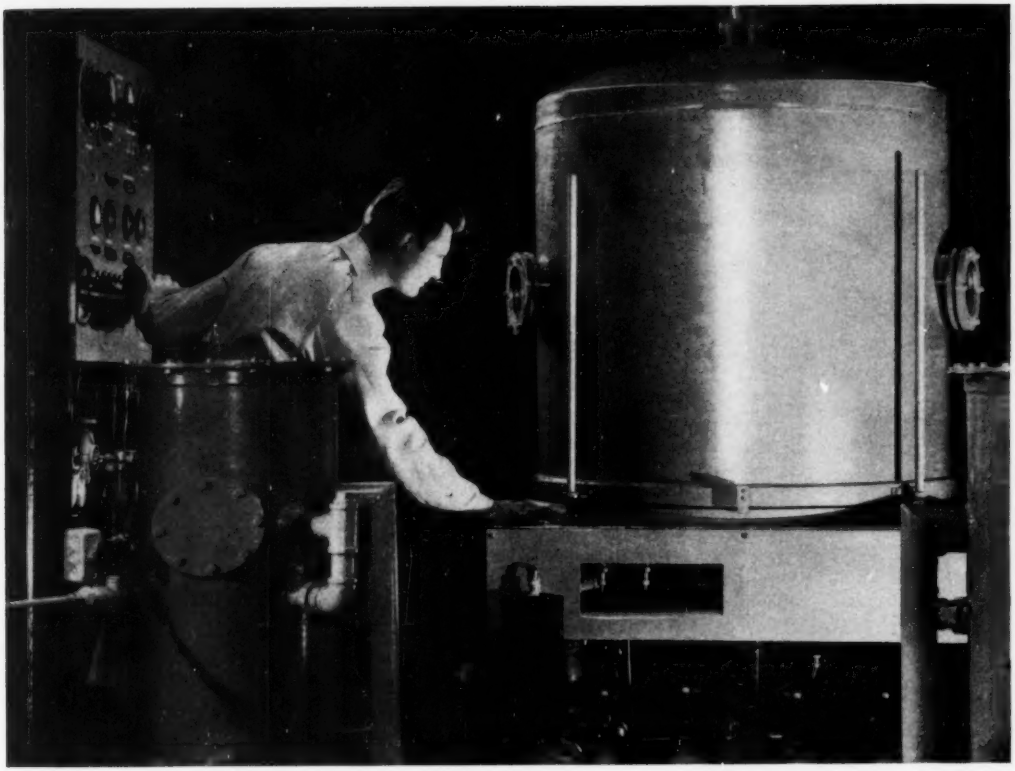

Watching an Economy Wave IN PLASTICS COATING

INSIDE the chamber are racks of plastic items being coated with a brilliant metallic surface. The application is vacuum coating. Special lacquers under and over the metallic film insure permanence and gloss.

The equipment is DPi-made. The lacquers are selected with DPi assistance. DPi technical advice made the entire project possible.

The stainless steel bell jar—38 inches in diameter and 42 inches high, shown above in DPi's LC1-36 Vacuum Coating Unit—is ideal for batch coating. Several manufacturers are using this unit for coating small plastic novelties for the dime store trade. It has proved its practical economy in this field where there is a very small margin per unit of sale.

New applications for vacuum coating are being developed almost daily. It is already a regular, standard production tool, lowering costs for many manufacturers.

Write for your free copy of the DPi booklet, "Vaporized Metal Coatings by High Vacuum." It gives full data for our entire line of coating units, ranging from a simple 10-inch bell jar to a 16-station turntable unit.

Be sure to see the DPi Exhibit of Coating Equipment and the work it does at the
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DPi
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The above illustration is another example of CRUVER'S versatility in the Industrial Custom Molding Field.

Produced for Vision Visor, Inc. of Chicago, who assemble the colored Lucite castings into metal framework for installation on automobiles.

Two castings are used for a set, each weighing 26 ounces and molded in our 40 ounce press

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MANUFACTURING CO.

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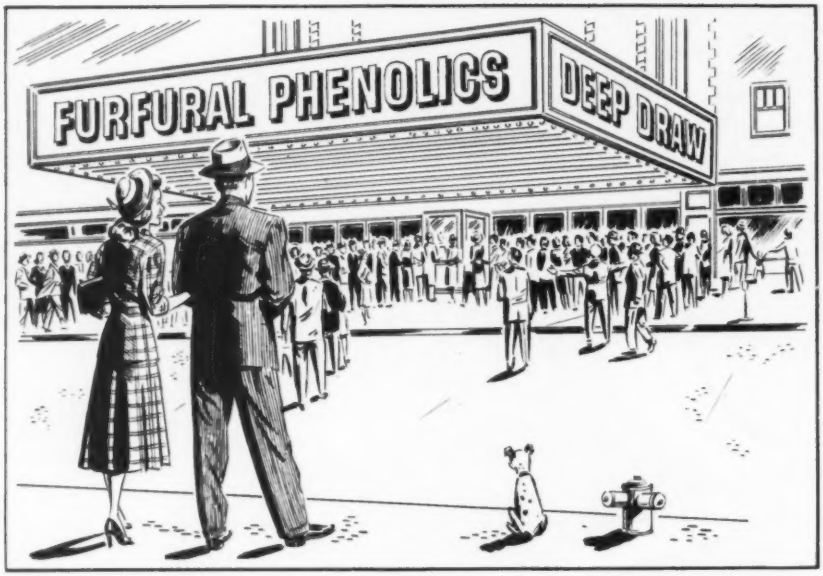
Vinyl organosols and **plastisols** have been developed specifically by the Watson-Standard laboratories for the plastics molding industry.

These products have properties heretofore not available with other types of plastics. They have permanent flexibility, good chemical resistance, excellent durability, and are easily applied.

They are not of standardized formula, but are compounded especially to meet the individual needs of each application. We will be glad to consult with you on your problem. Write us today.

Give us your plastic problem. We guarantee you an answer based on your conditions, and not just a standardized formula.

THE WATSON-STANDARD CO.
225 Galveston Ave. Pittsburgh 30, Pa.



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FURFURAL PHENOLICS GAIN IN POPULARITY

as demand for deep draw compounds increases

An important use of furfural-phenolics is to tailor molding compounds of optimum flow—cure ratios for deep draw moldings. The longer flow period achieved with furfural lessens the tendency to precure; it increases the rate of heat transfer in the molding compound and actually gives a faster cure time for specific deep draw items. Furthermore the correct rate of flow produces optimum appearance and strength in the finished article.

The Quaker Oats Company does not manufacture furfural-phenolic molding powders but is glad to put you in touch with suppliers. If you would like general information about furfural itself just ask for a copy of Bulletin 201.

QO CHEMICALS

The Quaker Oats Company CHEMICALS DEPT.

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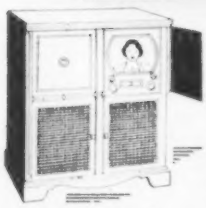
. . . and now a One Piece, Plastic Lens for a 16" TV Picture Tube

Custom Molded by ERIE RESISTOR for Sylvania Movie-Clear TELEVISION



Sylvania solved the problem of combining outstanding beauty with quality and economy in the design of lenses for its new line of TV receiver sets when it came to Erie Resistor to have them custom molded, frame and lens in one piece.

You've seen the 10" and 12½" . . . now comes the 16"—one piece, custom molded "Plexiglas", TV window. The advantages of such molded windows are obvious; low cost, ease of assembly, and ability to remove quickly to clean the front of the picture tube, if necessary.

Erie Resistor can make lenses for you in any design, clear and flawless for perfect reception, and will paint the frame in any color you desire. And lenses are only an instance of Erie Resistor's versatile ability to accomplish the unusual in custom molding.

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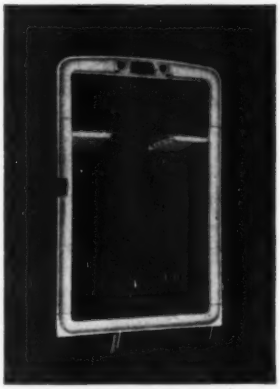
WE CAN REPEAT THESE PLASTIC SUCCESS STORIES FOR YOUR PRODUCTS!

Bridgeport Moulded has the experience, equipment, and skill to solve all plastic problems!

Our "Plastic Engineers" are solving plastic problems like those shown on this page all the time. Our success is based on the accumulated skill and knowledge gained in producing superior plastic components for companies in every field of American Business. On top of this, we have the most modern machinery and facilities available. Our die maintenance and repair shop is complete in every detail. We know plastics intimately and can recommend just the right product and moulding method for your particular job.

Add it all up. You can see why important companies everywhere call on us so often. Perhaps we can help you, too! Write today for consultation. No obligation.



New 1950 ***Westinghouse*** *Refrigerators depend on special* ***Bridgeport Moulded*** *baffles and breaker strips for improved cold control.*

Famous precision switches of Mu-Switch division of ***Chase-Shawmut*** *are made with* ***Bridgeport Moulded*** *plastics.*

Highly specialized ***Bridgeport Moulded*** *plastic caps contribute to the success of famous* ***Bridgeport Brass*** *Aer°A°Sol products.*

BRIDGEPORT MOULDED PRODUCTS, INCORPORATED

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THE WORLD'S WIDEST RANGE OF PLASTICS

is made in Great Britain by Imperial Chemical Industries Limited

'PERSPEX' *acrylic sheet and rod.* **'DIAKON'** *acrylic moulding powder.* **'ALKATHENE'** *polyethylene. Nylon monofilament.* **'LURON'** *brand of nylon fishing casts and lines.* **'SUTRON'** *nylon surgical sutures.* **'CORVIC'** *p.v.c. polymer.* **'WELVIC'** *p.v.c. compound.* **'KALLODENT'** *and* **'KALLODENTINE'** *acrylic dental materials.* **'MOULDRITE'** *thermosetting resins and moulding powders.* **'KURON'** *low pressure laminating resins.* **'FLUON'** *polytetrafluoroethylene.*

IMPERIAL CHEMICAL INDUSTRIES LIMITED

Plastics Division, Welwyn Garden City, Herts., England

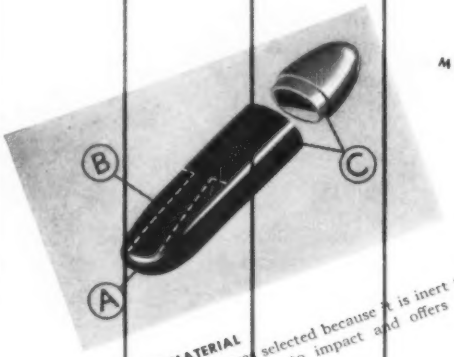
ICI

COLORFUL to the eye

SMOOTH to the touch

EASY to assemble

MANY THINGS ARE BETTER BECAUSE OF PLASTICS



MOLDING MATERIAL
Cellulose acetate was selected because it is inert to metal, highly resistant to impact and offers an unlimited color range.

MOLDING METHOD
Both the cap and the body are injection molded, each in an 8-cavity mold. Approximately 60,000 complete handles are molded in a week.

MOLD DESIGN
The molds are made with a mirror-like finish to produce parts that gleam without buffing. A fine, tapered blade in the mold forms the slot (A) which is only .030" wide. These slots extend through flanges (B) which support the knife blade inside the handle to a depth of 1½". Dimensions of cap and body at (C) are kept to close tolerances to insure easy assembly and rigid bonding.

At first sight the bright, satiny finish of this molded plastic handle calls for attention. Pick it up and the smooth, comfortable feel says . . . "working with this knife will be a pleasure".

AICO engineers, drawing on more than 30 years of precision molding experience with all materials and methods, are quick to combine saleability and practicality in all their recommendations . . . *plus* economy of manufacture. These putty knives, for instance, are complete by simply forcing the blade into an accurately molded slot. AICO engineers will be glad to help you apply the advantages of plastics to your product.

Aico PRECISION MOLDING

WRITE for *Aico's new portfolio of plastic applications. See how dozens of common articles have been improved by the use of plastics.*

AMERICAN INSULATOR CORPORATION
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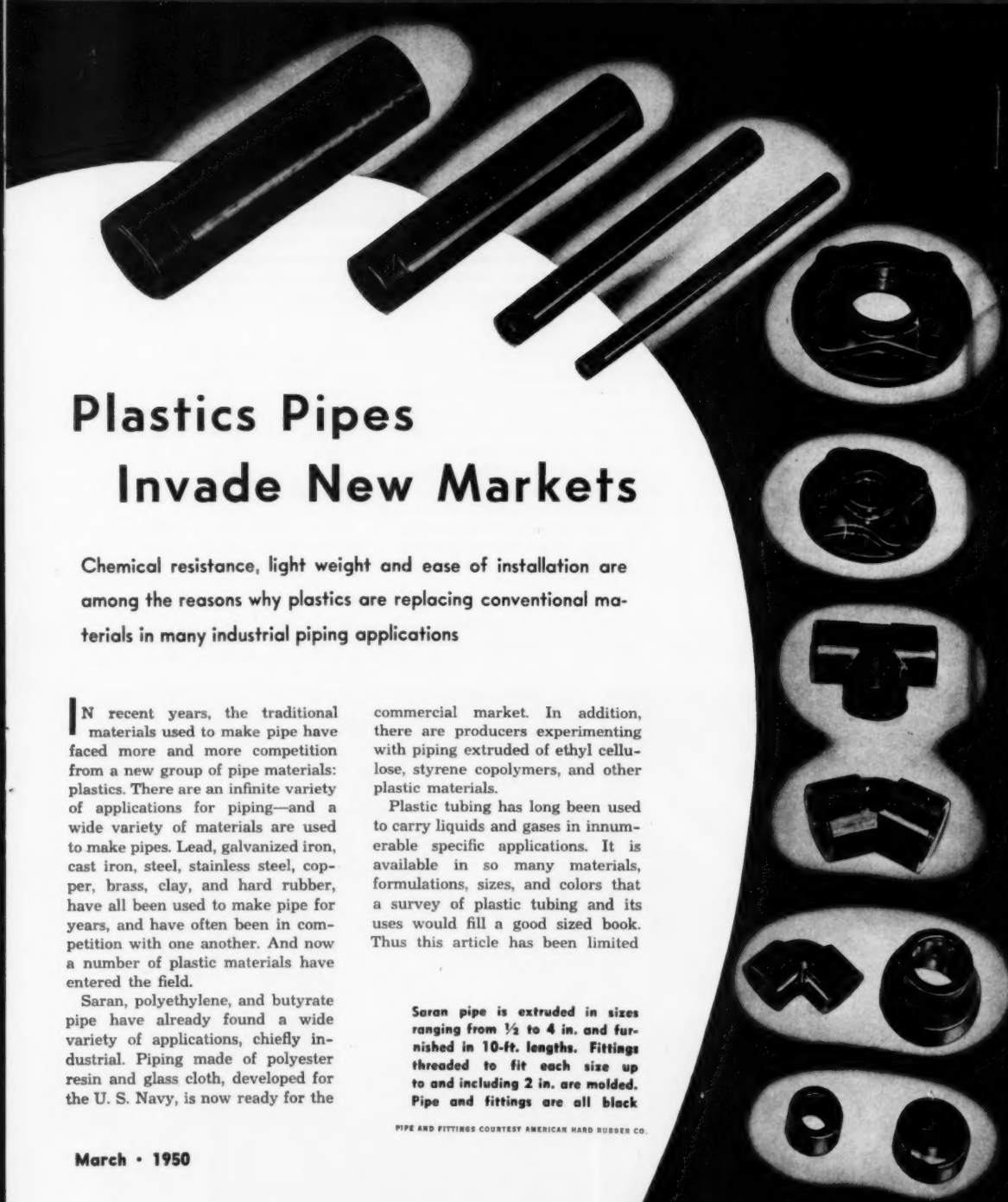
MODERN PLASTICS

VOLUME 27 MARCH 1950 NUMBER 7



Plastics Pipes Invade New Markets

Chemical resistance, light weight and ease of installation are among the reasons why plastics are replacing conventional materials in many industrial piping applications

IN recent years, the traditional materials used to make pipe have faced more and more competition from a new group of pipe materials: plastics. There are an infinite variety of applications for piping—and a wide variety of materials are used to make pipes. Lead, galvanized iron, cast iron, steel, stainless steel, copper, brass, clay, and hard rubber, have all been used to make pipe for years, and have often been in competition with one another. And now a number of plastic materials have entered the field.

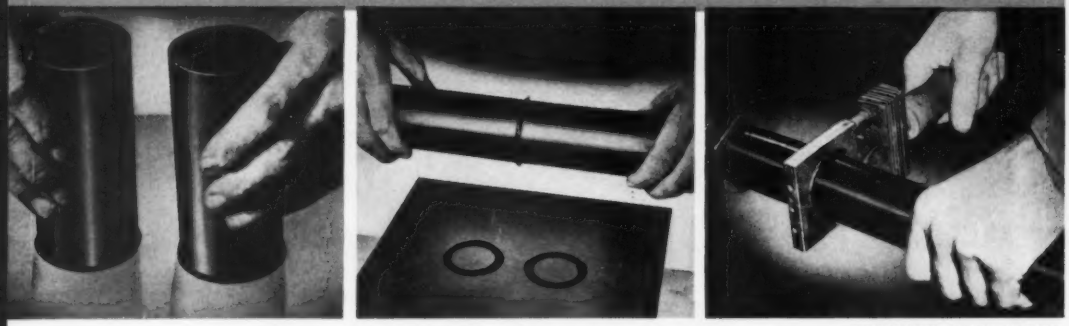
Saran, polyethylene, and butyrate pipe have already found a wide variety of applications, chiefly industrial. Piping made of polyester resin and glass cloth, developed for the U. S. Navy, is now ready for the commercial market. In addition, there are producers experimenting with piping extruded of ethyl cellulose, styrene copolymers, and other plastic materials.

Plastic tubing has long been used to carry liquids and gases in innumerable specific applications. It is available in so many materials, formulations, sizes, and colors that a survey of plastic tubing and its uses would fill a good sized book. Thus this article has been limited

Saran pipe is extruded in sizes ranging from ½ to 4 in. and furnished in 10-ft. lengths. Fittings threaded to fit each size up to and including 2 in. are molded. Pipe and fittings are all black

PIPE AND FITTINGS COURTESY AMERICAN HARD RUBBER CO.

WELDING SARAN PIPE



PHOTOS COURTESY ELMER E. MILLS CORP.

Two lengths of saran pipe can be welded by placing the ends on a hot plate until molten material appears (left), then pressing them together to cool for about 10 sec. (center). Hand-held heater (right) can be used for field work. Welded joints, after 24 hr., develop strength which is equal to that of the pipe itself

arbitrarily but necessarily, to plastic piping, its properties, and its various applications.

What, then, is the difference between "tubing" and "piping"? The distinction seems to be a rather nebulous one, and even companies which produce both tubing and pipe differ as to the definitions of the terms.

One producer states simply that "size is the essential distinction. Tubing is measured by outside diameter and wall thickness. Pipe follows standard heavy metal pipe sizes." Another producer offers the following definition: "Pipe is shipped flat in standard lengths instead of in coils, and bends are accomplished by fittings rather than by bending the pipe itself."

For the purposes of this article, an admittedly hazy line of demarcation was drawn, based on the criteria mentioned in the foregoing definitions. Some of the plastic "pipes" discussed below may perhaps straddle the line, but they all qualify as pipe by at least two of the three criteria.

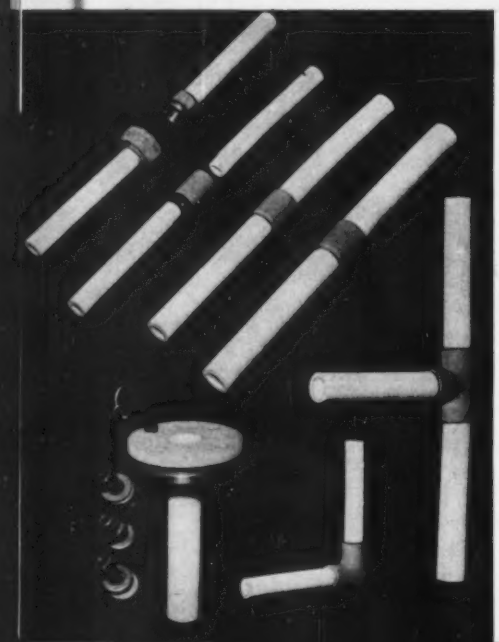
SARAN

On the basis of the volume attained to date, the most important plastic material in the piping field

In England, lengths of polyethylene pipe are joined with threaded metal or flanged polyethylene fittings

Polyethylene pipe comes in 50-ft. or 100-ft. coils which one man can easily carry. It can readily be cut to desired length with hack saw

PHOTOS COURTESY IMPERIAL CHEMICAL INDUSTRIES, LTD.



today is saran. The Dow Chemical Co., producer of saran, holds patents on the method of extruding saran pipe, and seven extruders[1] are operating under licenses from Dow.

The primary reason for the wide use of saran pipe is its inertness to a wide range of chemicals. As indicated in the accompanying list of typical applications, it is used to carry various types of liquids in different types of plants. Often its use eliminates maintenance costs which resulted from frequent replacement of the metal (usually stainless steel) pipe previously used. Additional advantages of saran include elimination of chemical contamination of the fluid as a result of reaction with the pipe and elimination of hazards caused by leaks from corroded piping. The fact that saran is a non-conductor prevents any electrolytic action.

Wood-Working Tools Used

Direct economy of installation expense often results because saran pipe can be cut with ordinary wood saws or hack saws and can easily be threaded with the same tools used for metal pipe. In addition, its light weight simplifies shipping and handling, and makes it easier to suspend the pipe in place in the final installation.

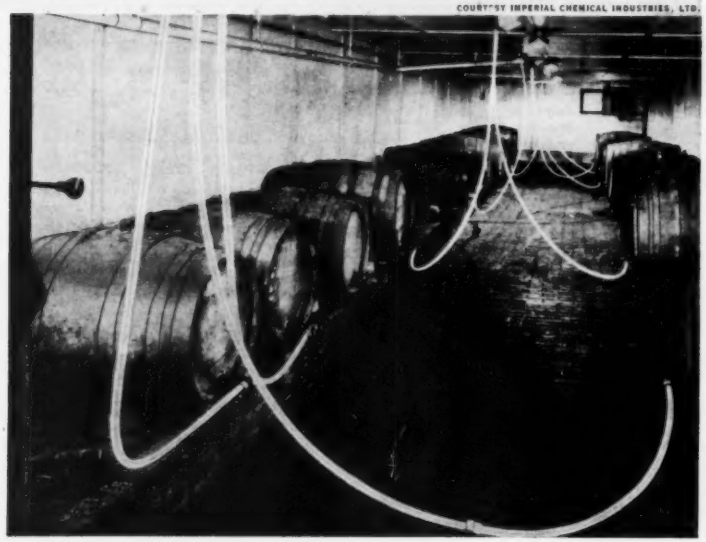
Elmer E. Mills Corp. and American Hard Rubber Co. are principal producers of saran pipe. Mills has a standard line ranging from ½ to 4 in. nominal pipe size. The sizes available are: ½, ¾, 1, 1¼, 1½, 2, 2½, 3, and 4 in., all furnished in 10-ft. lengths. American Hard Rubber produces a 3½-in. pipe as well as all of the sizes offered by Mills. Both producers use only black material. Ingwersen Mfg. Co. produces molded flanges for 2½, 3, and 4-in. saran pipe.

The method of extrusion involves a crosshead die through which a mandrel is passed and coated with the plastic material. The mandrel is rotated as it passes through the crosshead, and the outer surface of the pipe displays a rough spiral pattern as it leaves the extrusion die. Thus a smoothing operation is required. This is accomplished through two rolls, the first of which also controls the outside diameter of the pipe. The second roll gives the outer surface a final smoothing. The pipe is then drawn through a sizing die,

[1] American Hard Rubber Co., New York, N. Y.; Elmer E. Mills Corp., Chicago; Plastics Industrial Div., Ingwersen Mfg. Co., Inc., Denver, Colo.; St. Louis Plastic Molding Co., St. Louis, Mo.; Trustee System Discount Corp. of Chicago, Chicago; Pyramid Plastics, Chicago; and Western Felt Works, Inc., Chicago.

The flexibility of polyethylene pipe and its resistance to alcohol makes it ideal for carrying beer or ale to the tap room from kegs stored in cellar

COURTESY IMPERIAL CHEMICAL INDUSTRIES, LTD.



TYPICAL APPLICATIONS OF PLASTICS PIPES

SARAN

To carry electroplating solutions.
In rayon processing plants.
In mass-production photo developing and printing plants.
As an electrical installation between magnesium cells and cooling water supply in the heat exchangers in magnesium plants.
In city water and sanitary system treating equipment.
To carry acids, caustic solutions, and some solvents in pharmaceutical plants.
In chemistry laboratory waste systems.
As electrical conduit in highly corrosive atmosphere.
As intake pipe for sea water for hotel swimming pools.
As intake pipe for fresh lake water for domestic use.
In petroleum cracking plants.
In paper plants.
In food processing plants.
For various undisclosed applications in atomic energy plants.

POLYETHYLENE

In chlorine-treating equipment in bleach-manufacturing plants.
In food plants, particularly for use with sugar solutions.
In soft drink bottling plants.
In chemical plants.
For rural cold water systems (in England).
To carry beer from cellar kegs to bar taps (in England).

BUTYRATE

To draw off salt water from crude oil deposits.
To carry gas from street mains to users' homes.
In rural water systems.
In lawn sprinkler and greenhouse irrigation systems.
In soft drink bottling plants.
For gasoline lines from tanks to filling station pumps.
For water lines in Boeing Stratocruisers.
To handle sour crudes, paraffin crudes, and raw gas in oil fields.

after which the mandrel is removed from the pipe.

Molded Fittings

Both Mills and American Hard Rubber offer injection-molded threaded fittings to fit each size pipe up to and including 2 inches. The fittings available include: 90° elbow; 45° elbow; tee; blind flange; companion flange; coupling; reducing coupling; cap; and pipe plug. In the larger sizes, the pipe lengths are joined by welding, and fittings can be fabricated by cutting and welding pieces of pipe.

To weld two pieces of saran pipe, the ends are first placed on a hot plate maintained at a temperature of 350 to 500° F., and held there until molten material appears. The pieces are then removed from the hot plate, pressed together firmly in the desired position, and allowed to cool for about 10 seconds. The joint is then strong enough so that the pipe can be handled freely. The full strength of the joint, which develops after 24 hr., is equal to the strength of the pipe itself. A variation of this method involves the use of heated hand iron instead of a hot plate.

POLYETHYLENE

The unusual chemical resistance of polyethylene and the comparatively low price of the raw material have naturally stimulated a great deal of interest in the possibilities of polyethylene pipe. As yet, however, polyethylene pipe has not emerged from the development stage in this country. One of the main obstacles is the difficulty of producing a pipe with sufficiently uniform wall thickness all around.

Elmer E. Mills Corp. has produced a limited quantity of polyethylene pipe similar to its saran pipe up to the 2-in. size. Much of this has been made into pipe nipples for use in water piping in Park Forest, Ill., where electrical current in the ground destroys uninsulated pipe lines. The polyethylene interrupters break up the flow of current through the metal pipe lines.

Experts are agreed that, when production problems are overcome, polyethylene pipe will find wide use, especially in the food industries, in soft drink plants, and in pharmaceutical plants which are confronted with piping problems which even saran cannot solve.

American Hard Rubber Co. and at least three other extruders are known to be experimenting with polyethylene pipe.

Polyethylene Pipe in England

In England, polyethylene pipe in a slightly different form is being produced by Imperial Chemical Industries, Ltd. The Alkathene pipe or tubing is extruded in nominal sizes of ½, ¾, and 1 in. with a wall thickness of 3/16 in. or ⅛ inch. The pipe is available in 50 or 100-ft. coils, and in either black or natural color polyethylene.

I.C.I. reports that the Alkathene pipe is used for carrying water to houses or outbuildings in rural areas, for carrying beer from cellar kegs to taps in pubs, and for carry-

WEIGHT AND BURSTING PRESSURES OF PLASTICS PIPES

	SARAN [a]			POLYETHYLENE [b]			BUTYRATE [c]			POLYESTER-GLASS CLOTH [d]		
Pipe Size (in.)	Wall Thickness (in.)	Weight (lb./ft.)	Bursting Pressure (p.s.i. at 77°F.)	Wall Thickness (in.)	Weight (lb./ft.)	Bursting Pressure (p.s.i. at 68°F.)	Wall Thickness (in.)	Weight (lb./ft.)	Bursting Pressure (p.s.i. at Room Temp.)	Wall Thickness (in.)	Weight (lb./ft.)	Bursting Pressure (p.s.i. at Room Temp.)
⅜							.060	.069	600			
½	147	.236	1300	.1875 .125	.150 .070	900 600	.062	.089	525			
¾	154	.320	1060	.1875 .125	.200 .140	600 400	.062	.104	500			
1	179	.475	970	.1875 .125	.255 .175	450 300	.065	.142	450	.080	.320	7350
1¼	191	.650	820				.070	.185	300			
1½	.200	.790	740				.075	.239	300			
2	.218	1.090	620				.095	.406	300	.125	.650	5250
2½	.299	1.805	570									
3	.329	2.480	510							.188	1.47	5750
3½	.346	3.010	470									
4	.375	3.760	460							.250	2.60	5750
5										.310	4.03	5700

[a] Data from Elmer E. Mills Corp

[b] Data from Imperial Chemical Industries, Ltd.

[c] Data from Plastics Industrial Div., Ingwersen Mfg. Co., Inc.

[d] Data from United States Plywood Corp.

ing various chemicals known to attack metal pipe. The pipe with 3/16-in. wall is recommended for cold water plumbing and the thinner-walled pipe for a variety of industrial applications.

The cost of Alkathene pipe is said to be "considerably less than lead and about that of copper." Installation costs of the plastic pipe are much below those normally charged for metal because of its light weight and ease of manipulation.

The Alkathene pipe with 3/16-in. wall can be threaded with standard metal tools if a mandrel is inserted in the bore to stiffen the pipe during the threading operation. Standard metal fittings with tapered threads can be used satisfactorily. Threading of pipe with wall thickness of less than 3/16 in. is not recommended.

Butt-Welded Joints

The pipe with 3/16-in. wall can also be used with compression-type couplings designed for use with thin-walled copper tubing. Joints can also be made with fittings or by butt-welding the polyethylene pipe.

To butt-weld the Alkathene pipe, the ends are first chamfered to an angle of 60°. The ends are then heated by holding them about 1/4 in. away from an electrical heating element until the polyethylene starts to melt. The pipes are then transferred to a jig, brought together with a twisting motion, and held under light pressure until they cool to room temperature.

The pipe can also be jointed with sleeves made from Alkathene tube. The sleeve, about three times the length of the bore, is heated in boiling water, forced over the ends to be jointed, and then welded with a hot gas welding torch and polyethylene filler rod.

BUTYRATE

In the United States, cold water rural plumbing installations, similar to those for which Alkathene pipe is used in Britain, are being made with pipe extruded of Tenite II cellulose acetate butyrate. The same pipe has been used by the Southern California Gas Co. to carry gas from the mains to the customers' homes.

A standard line of butyrate pipe and injection-molded fittings is being produced by Plastics Industrial Div., Ingwersen Mfg. Co., Inc., Denver, Colo. Nominal sizes of 3/8, 1/2, 3/4, 1, 1 1/4, 1 1/2, 2, and 3 in. are made. The molded fittings are not threaded. The pipe slips inside the fittings and is held in place by an integrally molded flange which fits inside the pipe. Acetone or some other cement can be used to bond the pipe to the fitting in permanent installations.

JOINING BUTYRATE PIPE

PHOTOS COURTESY INGWERSEN MFG. CO., INC.

Molded coupling (above) is used to join butyrate pipe. Solvent is poured into coupling (1), coupling is fitted on pipe (2), solvent is put in other side of coupling and second pipe end is joined to it (3). Joint is then allowed to dry (4)

Used in Corrosive Soil

The advantages of the butyrate pipe are: light weight; ease of installation; resistance to damage from freezing; resistance to soil chemicals. It has been used successfully in rural water systems in soil which causes metal pipe to corrode in two or two and one half years.

One of the most promising applications for butyrate pipe was demonstrated recently in Great Bend, Kan., when a 3387-ft. string of butyrate pipe was run to draw off salt water from crude oil deposits on the Harbecek lease of the National Cooperative Refinery Association. The Tenite II pipe was used with excellent results in place of the cement-lined steel pipe usually used.

The 2 1/2-in. butyrate pipe used was extruded by Carter Products Corp., Cleveland, Ohio, for Green Contracting & Engineering Co., Wichita,

Kan. The light weight of the pipe 0.826 lb. per ft.) cut the weight of the string from about 17½ tons to 1½ tons. The string, made up of threaded 20-ft. lengths, was run in 4½ hours. An additional 8500 ft. are being installed as a gathering line for this and nearby leases.

The Harbecek installation, which was witnessed by many expert observers, excited much interest in the oil industry and is expected to be the forerunner of many such applications of butyrate pipe. Another salt water disposal installation has been made on the J. F. Ferrel Drilling Co. lease by Paldon Contracting Co., Wichita, Kan. Paldon used 3-in. butyrate pipe made by Ingwersen Mfg. Co.

POLYESTER

Under a two-year contract with the U. S. Navy Bureau of Ships, United States Plywood Corp., New York, developed corrosion-erosion resistant pipe and fittings for shipboard use made of glass cloth and polyester resin. Since the expiration of the contract, U. S. Plywood has improved its production methods and the pipe, called Glasweld, is now being offered commercially.

The reinforced polyester pipe offers great promise because of its high heat resistance and its unusual strength. With internal pressure of 450 p.s.i., Glasweld pipe will operate continuously with ambient temperatures up to 325° F. With internal pressure of only 150 p.s.i., operating temperatures can range as high as 425° F. It is even possible to make the pipe flame-proof by coating it with Albi R, which is made by Albi Mfg. Co., Hartford, Conn.

Strength Properties

In strength, Glasweld pipe and fittings are claimed to have the highest hydrostatic bursting strength-weight ratio of any known material. Its tensile strength of 50,000 p.s.i. is equal to that of stainless steel pipe, but its specific gravity of 1.8 (as against 7.8 for stainless steel) gives it a strength-weight ratio of 27,800 as compared with only 6400 for stainless steel.

The producer feels that the polyester pipe will find its way chiefly into chemical plants where it is recommended for carrying mild acids such as dilute hydrochloric and dilute sulfuric. It is also considered applicable for oil field and bleaching plant operations. It is not recommended for use with strong acids or alkalies.

Originally, Glasweld pipe was produced by convolutely wrapping glass cloth on an aluminum mandrel and impregnating it with polyester resins. Recently, U. S. Plywood has developed another method of production which is more economical and produces a stronger pipe.

Pipe Wrapped Spirally

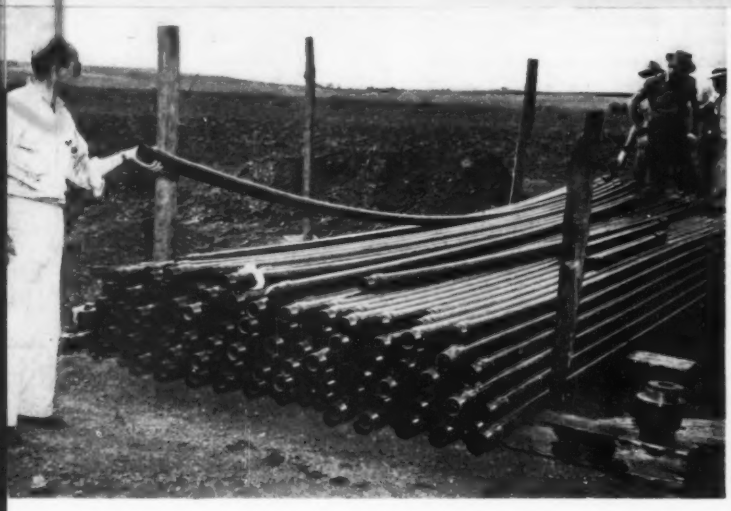
The new method, on which a patent has been applied for, involves helical wrapping with unidirectional tape, with the tape running at a 60° angle to the pipe length, and with alternate layers wound in opposite directions. This method gives the pipe twice as much strength circumferentially as longitudinally, which is desirable in pipe. After the tape is wrapped, the mandrel is heated with steam to about 220° F. for about 7 minutes. Pipe from ¼ to 6 in. in size can be produced in this manner in lengths up to 20 ft.

The fittings are wrapped dry on a male steel mold, then placed in a split female mold. The resin is then injected into the closed mold by air pressure while a vacuum is pulled in the mold ahead of the resin. The fittings are cured cold.

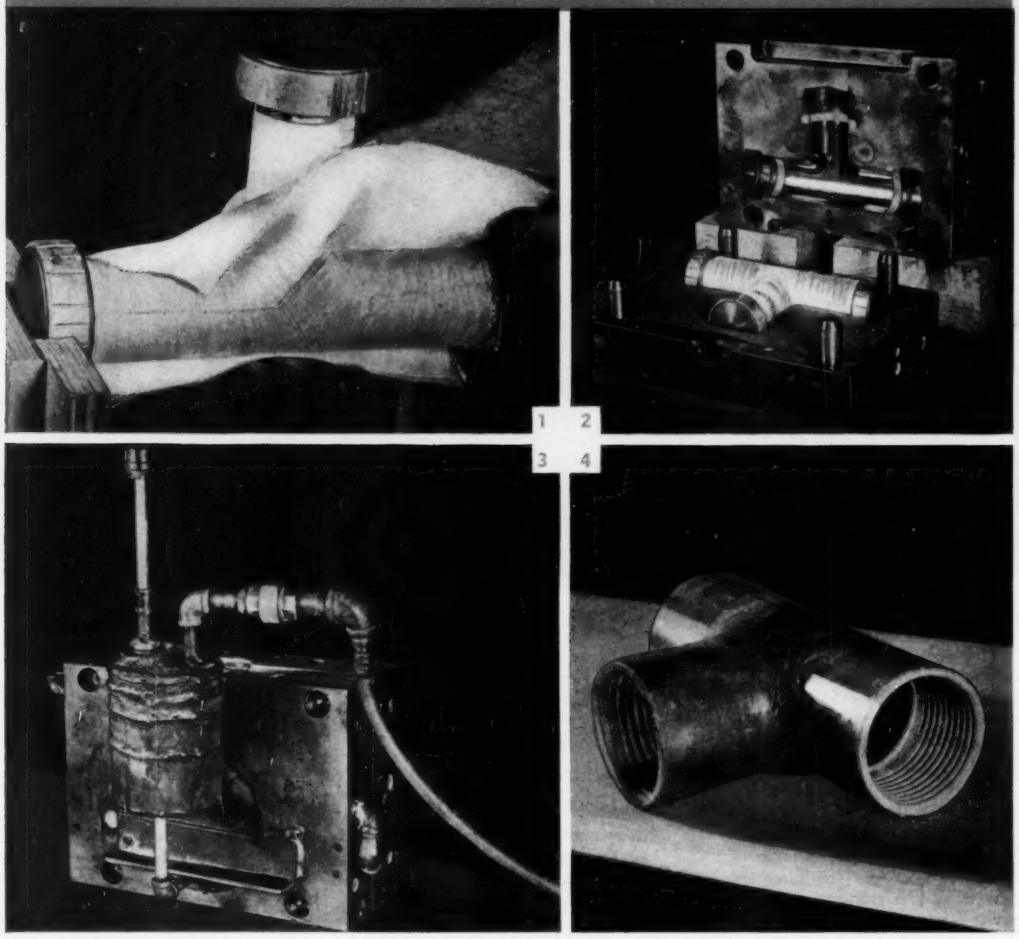
Threads (either a modified Acme or a V-thread) are machined on the pipe. U. S. Plywood is also experimenting with tapered fittings instead of threaded. With these, a taper would have to be ground on to the

Threaded 2½-in. butyrate pipe is used for drawing off salt water from crude oil deposits. One man can easily lift a 20-ft. length of butyrate pipe (left) and it can be installed (right) quicker and more economically than steel

PHOTOS COURTESY TENNESSEE EASTMAN CORP.



MOLDING POLYESTER PIPE FITTING



PHOTOS COURTESY UNITED STATES PLYWOOD CORP.

To produce reinforced polyester pipe tee, glass cloth is wrapped on male steel mold (1) and placed in split female mold (2). Polyester resin is injected into closed mold by air pressure (3) and cured cold. Finished pipe tee (4)

pipe, which would then be forced into the fitting and bonded in place with polyester resin.

Future Possibilities

The foregoing survey of the competitive position of plastic piping can be summed up as follows: 1) saran pipe has proved itself in many industrial applications and is rapidly finding new uses; 2) polyethylene pipe, now in the final stages of development, shows great promise because of its low price and high chemical resistance; 3) butyrate pipe is experimental in many applications but has proved itself in one field where a single installation can take tons of material; 4) glass cloth reinforced polyester pipe, with higher heat resistance than other plastic pipes and a higher strength-weight ratio than any pipe material, is now ready to battle for its share of the pipe market; 5) pipe made of other plastics may soon be in production.

Only the foolhardy would venture to predict how much of the piping field plastics may eventually capture. Those with great faith in the future of plastics even dream of plastic piping in the home. When asked about that possibility, one expert expressed doubt that plastics would ever have the heat resistance or the low price necessary to compete with iron. Perhaps so. But there were once many experts who were convinced that the horseless carriage would never have sufficient reliability or economy to be able to compete with the horse.

One step in dry-color process is weighing colorant blend—rough-cut crystal styrene granules

Proper measure of dyestuff for desired color is weighed. At most, two dyestuffs should be used

ALL PHOTOS COURTESY ARNOLD BRILHART, LTD.

New Color Development for

THE development of a new process of dry coloring crystal styrene enables molders to obtain bright, practical colors by doing their own color blending and thereby effect a substantial saving.

The new process makes use of the most economic and basic method of manufacturing colored styrene products—a blending of dyestuff and crystal by the molder with minimum cost, simple tumbling equipment, and maximum coloring results. Expensive intermediate steps are eliminated.

Tiny rough-cut crystal granules of styrene, termed "colorant blend" and which incorporate a specially prepared coating of dispersing agents, are the focal point of the new process. The treated rough-cut crystals—only 1/16 to 1/8 in. in size—overcome the obstacles that previously interfered with successful dry blending by molders.

Although dry coloring has been known for years, it has been plagued by difficulty in obtaining brilliant colors and by aggravating dusting of dyestuffs due to poor adherence to the surface of the styrene granule. Conventional methods of blending produced only mediocre colors. The development of a new formula, with special treatment of the granular surfaces, allows rapid and thorough dispersion, thus permitting integrated coloring and molding operations.

Good Utility Colors

With this new colorant blend crystal styrene, attractive utility colors, without the objectionable mottling or streaking normally attributed to dry coloring, are obtainable at a cost lower than can be secured by any other method. Transparent, translucent, and metallic colors can be achieved simply and easily by use of the proper colorant and inexpensive equipment. Formulations for 12 basic brilliant colors are available. In fact, many of these colors are more brilliant than can be obtained in conventional pelletized form, because the colorants and the styrene resin are not subjected to rigorous processing, roll milling, or extrusion, which often serves to dull the color.

Obviously, direct injection molding of simply blended dyestuffs and crystals is basically more economical than any other coloring process which requires roll milling or extrusion after blending. Dry colored blending is as simple as it sounds. Fine crystal granules are mixed with the correct weight of dyestuffs in simple mixing equipment. One of the most effective types of mixing processes is an end-over-end barrel tumbler. Even a cement mixer has been known to do a creditable job.

The recommended process with the new colorant blend crystals requires only the tumbling equipment and a separate barrel for each color needed. The crystals are emptied into the barrel in from 100 to 200-lb. lots, and the appropriate weighed amount of dyestuffs required for the desired color is added. The colorant blend crystals

Colorant blend crystals and dyestuff are tumbled from 10 to 30 min., then fed to presses

Dyestuff is added to crystals. Surface treatment of granules gives improved adhesion

Styrene Molders

by E. L. HOBSON*

and dyestuff are tumbled from 10 to 30 min., then emptied into bins or tote-barrels for feeding directly to the press.

Savings are immediately apparent in the elimination of intermediate compounding. The cost of operating with the new process, of course, depends upon the cost of colorants used and local labor charges. Typical cost of coloring by this method varies from ½ cent to 1½ cents per pound.

While lending itself immediately to proprietary lines—housewares, toys, novelties, advertising premiums—the new process has definite limitations with respect to moldability of large parts. Due to the high bulk factor resulting from the tiny size of the granules, molders using machines to the limits of capacity may find some difficulties.

It is essential that the process remain as simple as possible to effect the greatest savings. A single dyestuff should be used or, at the most, two. In changing from one color to another in the injection machine, extreme care should be taken to wipe out thoroughly all traces of colorant blend colors used in the previous job, not only in the feed hopper but in the feed sleeves. Careless cleaning will inevitably be followed by contamination from dyestuffs left behind from the previous operation.

The process does not lend itself to color matching in the accepted sense. Where strict adherence to exact color standards is essential, as in refrigerator parts, wall tile, and similar applications, use of standard processed colors is still advised. Dyestuff manufacturers and certain color specialists are equipped to provide dispersions which will approximate most commonly encountered colors, and Monsanto is making available information as to sources of stable colorants for styrene, equipment, and data on processing technique. In addition, H. Jamison, Freeport, L. I., N. Y., offers packages of colorants as well as tumbling equipment and specific advice on coloring.

*Sales manager, Thermoplastic Molding Materials Dept., Monsanto Chemical Co., Springfield, Mass.

Dusting Reduced

One major objection to dry colorant blend — the widespread scattering of dyestuffs throughout the plant—has been frequently voiced. This complaint has been met by the new colorant blend crystals. The new type surface treatment of the rough-cut crystal, giving greatly improved dispersion and adhesion, is the answer.

The affinity of the specially treated granule for the dyestuff effectively curtails the dust factor. However, as a precaution against accidents caused by mishandling, it is recommended that the mixing and molding rooms be kept separate.

The use of dry colorant blending by molders will minimize the cost of coloring and will make possible the manufacture of many additional bright, salable products heretofore made in crystal because of cost.

Technical Conference—S. P. E.

Report of papers presented, officers and council members elected, and special company registration

WITH more than 450 members registered for what may well have been the most successful conclave to date, the Sixth Annual Conference of the Society of Plastics Engineers was conducted at the Hotel Carter, Cleveland, Ohio, on Jan. 11 to 13.

Highlighting the three-day gathering was the election of C. Todd Clark, F. Burkart Mfg. Co., as president for the coming year. Other national officers named at this meeting include: Islyn Thomas, Thomas Mfg. Corp., vice president; Robert L. Davis, Continental Can Co., secretary; and William O. Bracken, Hercules Powder Co., treasurer. Shown in the accompanying photograph are members of the 1950 National Council.

Processing on Calenders

Presiding at the first morning session was Thomas E. Orr, Plastic Engineering, Inc., who acted as moderator for a program featuring three guest speakers. Leading off, T. J. Kerr, of Yardley Industries, Inc., analyzed the operation of processing plastics on calenders. Stating that pre-blending, especially with heat, always adds to the quality of thermoplastics, Mr. Kerr went on to suggest that calenders could be improved by incorporating automatic adjustment of rolls, both vertically and horizontally, and expressed the opinion that new calenders should be lightly framed and have smaller rolls, thus requiring less power. He observed that a four-roll calender would produce film of more accurate gage than a two-roll.

Uniform Temperatures

Requirements of a modern heating system for use in processing plastics was the subject of the next speaker, Paul L. Geiringer, of American Hydrotherm Corp. Mr. Geiringer explained the advantages of using a high-temperature liquid system instead of steam. He claimed that with the high temperature system, temperature uniformity as close as plus or minus ½° F. could be obtained. Inasmuch as there are no reducing valves or condensate valves used in the system, a minimum of maintenance work is required.

Static Eliminators

The final speaker on the morning program, Merrill J. Ainsworth, engineering consultant, spoke on a means of eliminating electrostatic accumulations in plastics by the Electrosol Process. He explained that in the plastics industry, problems involving static electricity are generally considered in four catagories: 1) problems encountered in handling and fabricating; 2) problems affecting the mechanical performance of the plastics; 3) problems of appearance of the manufactured part; and 4) problems of hazard to material, facilities, and personnel.

Gilbert Thiessen, of Koppers Co., Inc., was guest speaker at the Society's luncheon, which was attended by over 300 members and their guests. Mr. Thiessen, who was introduced by A. R. Olsen, Hercules Powder Co., classified the ten major plastics groups as follows: cellulosics, polystyrene, phenolic, vinyl, nylon, polyethylene, urea formaldehyde, alkyd, melamine, and acrylic. In order to produce these plastics, basic chemicals are required from coal carbonization, from the petroleum industry, from the heavy chemical industry, and from the agricultural industry. Mr. Thiessen pointed out that the investment for production of these raw materials was approximately five times that required for the background equipment needed for steel. By means of charts, he illustrated the sales trends for each material of the plastics groups, and also illustrated graphically the available supply of the various components which are needed for their production.

Of Benefit to Molders

At the afternoon technical session, Elmer E. Mills, Elmer E. Mills Corp., was introduced by Mr. Olsen. Mr. Mills offered to the manufacturers

National Officers, S. P. E., 1950

Islyn Thomas, Vice president — C. Todd Clark, President — Robert L. Davis, Secretary — Wm. O. Bracken, Treasurer

of injection molding machines several recommendations which, in his opinion, would be of benefit to molders. He advised that machines be made safer and more economical to operate; that safety gates be opened automatically; and that all motions of the machine be accelerated. After recommending a longer stroke on the die plate—which, of course, should be adjusted for thinner dies—Mr. Mills proposed that something be done to reduce the time and expense for cleaning out the cylinder; one solution advanced is pre-plasticization.

(Ed. note: Watson-Stillman Co., Jackson & Church Co., and Crown Machine & Tool Co., Inc., now sell machines provided with pre-plasticizing equipment.)

Mr. Mills went on to suggest that a mold handling device should be an integral part of each molding machine and that a refrigerator unit for handling mold coolant as well as cooling the hydraulic oil should be furnished with each molding machine. Pyrometer controls, in his opinion, should be on a separate panel in order to indicate and control more accurately.

If these suggestions are followed, Mr. Mills stated, the injection molder will be able to compete more readily with the light metals.

Larger Pieces

The next speaker, S. D. Hiltebrant, The General Industries Co., discussed developments in thermosetting materials. First, he noted that the volume of sales of thermoplastics passed that of thermosetting materials in July of 1948. The reasons given were as follows: newer and better materials; larger injection machines; and refrigerator and radio companies specifying thermoplastics for the replacement of thermosetting materials and metals.

Mr. Hiltebrant said that in 1947 he told a representative of MODERN PLASTICS Magazine that, in his company's opinion, piece size and weight in thermosetting materials had reached their top limit. He was very frank to admit that he realizes now that he was wrong. General Industries has installed several large presses up to 3000 tons capacity.

Mr. Hiltebrant also stated that the economics of large pieces practically dictated the use of radio frequency pre-heating. He discussed the so-called low pressure phenolic molding compounds, citing the advantages gained by the use of these compounds, with which molding pressure is approximately one-third that required when standard general purpose materials are used with high frequency pre-heat.

National Council, S. P. E., 1950

1950 National Council, S.P.E. Standing, left to right: James Growley, Celanese; William Dunnican, Synvar; Robert G. Dailey, Wolverine Plastics; Richard B. Bishop, Socony Vacuum; W. O. Bracken, Hercules Powder; George W. Clark, Plaskon; Walter Oelman, Standar Molding Corp.; Islyn Thomas, Thomas Mfg. Corp. Seated, left to right: Earl A. Russell, Spalding Fibre Co.; Stanley Bindman, Noma Electric; C. Todd Clark, Burkart Mfg. Co.; Mario J. Petretti, Rogers Plastics; Bess Day, Executive Secretary; Robert L. Davis, Continental Can Co. Front row, left to right: John W. LaBell, Koppers Co.; Marion A. Arthur, Humble Oil Co.; Richard L. Huber, Hercules Powder Co.; Wayne I. Pribble, Barrier-Pribble and Associates; William L. Hess, Anesite Co.

Molding Problems

Molding problems and their solutions comprised the topic of the next speaker, D. J. Snyder of Koppers Co., Inc. Mr. Snyder listed 10 important variables which must be accurately controlled if good pieces are desired: 1) cylinder temperatures; 2) cylinder temperature gradient; 3) injection and clamp pressures; 4) cycle—both plunger and cooling; 5) proper control of feed; 6) design of dies; 7) design of sprue, runners, and gates; 8) material specifications as related to end use of product; 9) feeding back of re-ground; 10) running machine beyond capacity.

The S.P.I. report on Informative Labelling was then read by P. A. Belk, Hercules Powder Co. He pointed out the steps that the S.P.I. has taken so far in promoting this plan so important to the plastics industry and also spoke of the action taken along these lines by the materials companies.

Extruder Pump

James W. Hendry, Jackson & Church Co., described the new injection machine being manufactured by his company. This machine is equipped with a horizontal extruder pump feeding into a vertical injection chamber; when the material has passed through the extruder pump into the injection chamber it is thoroughly plasticized and ready to be injected. Mr. Hendry explained that this accounts for the relatively light construction of the mold clamp.

After his talk, many questions on actual operating procedures and operating experience of the machine were directed at Mr. Hendry. It was explained that the Jackson & Church 48-oz. machine was classified in that manner because the extruder pump would thoroughly plasticize 48 oz. of material every 15 seconds; it was added, however,

Mario J. Petretti
Retiring President

Gilbert Thiessen
Luncheon speaker

that the machine is capable of delivering 112 oz. at one stroke of the injection piston.

Polyethylene

The moderator for the morning session on Jan. 12 was George W. Clark, Owens-Illinois Glass Co., who introduced the first speaker, C. W. Patton, of Bakelite Div., Union Carbide & Carbon Corp. In discussing low molecular weight polyethylene, Mr. Patton stated that, because of the low pressure and relatively low temperature required for handling this material, it is successfully used as a potting compound. Applications such as coating and impregnating transformer coils or other electrical applications make wide use of this material. It has also been successfully used to produce samples from injection molds without mounting the mold in an injection machine. Coatings for chemical equipment are produced by flame spraying the material in a powder form. In combination with wax, this material produces a superior wrapper coating for bread and other bakery products, and, without wax, is being utilized for packaging frozen foods.

Continuous Laminates

The second speaker that morning, Stanley M. Cash, Continental Can Co., described his company's operations in the continuous laminating field. He emphasized that, in the production of such laminates, not only is there a problem in getting heat into the laminate for curing, but, at a later stage in the curing cycle, it is just as necessary to remove the exothermic heat.

Mr. Cash went on to explain that, up to the present, decorative laminates have been used primarily as a horizontal surfacing material, such as on dinette tables, sinks, and counter tops; it has not made much headway on vertical surfaces, chiefly due to cost and difficulty of installation.

Plastic Coaters

A description of the construction, method of operation, and advantages of the four general types of coaters used for plastics was provided by the third speaker on the morning program, A. J. Gaio, John Waldron Corp. The classifications are—knife, roll, air, and cast coaters. Mr. Gaio divided the knife coaters into three types: a floating knife coater, in which the knife is supported only by the web; a blanket-type knife coater which employs a solid rubber blanket as a carrier for the web and support for the knife; and a rubber spreader, which employs a knife mounted above the roller, this roll acting as a backing for the web.

Mr. Gaio continued with the statement that there are many types of roll coaters, but the more important are the doctor-kiss coater (which is a combination of the knife and roll coaters) and a roll-kiss coater which employs two identical rolls, one rotating in a trough of the material and the other being mounted in a vertical plane and acting as a carrier for the web. One of the newest developments of roll coaters was described as the edge-wise coater with which either a one-side or a two-side coating should be employed. Mr. Gaio stated that the reverse-roll coater—in which the thickness of the coating cast onto the web is governed by the opening between the doctor and casting rolls, or by changing the speed of the casting and doctor rolls in relation to the web speed—was probably the most flexible type of unit now available. He concluded his remarks by cautioning his listeners that no one type of coater will solve all coating problems and that each type is designed to handle one particular material best.

Radiant Heating

Thomas F. Walsh, of the Sill Paper Co., described the construction and the various uses of his company's radiant heating panel. This panel is a glass fiber base unit from which can be derived a very uniform heat at a very low operating cost, comparing favorably in many areas with gas or steam.

The temperature ranges obtainable from this panel are from 120 to 700° F. Mr. Walsh explained that these panels are being used for heating plastic sheets before forming, and observed that coating and embossing is greatly speeded up through the use of this heating method.

Heat Sealing

Case histories of a number of articles which have been produced with special high-frequency heat-sealing equipment, were reviewed by Edward J. Wohlfarth, Mayflower Electronic Devices Co. Some of these articles are rain wear, shower curtains, table cloths, sports wear, etc. In many cases, they are produced on fully automatic machines which take the material from a roll, cut it, heat seal it, and deliver the product in a finished condition at the end of the machine.

Business Meeting

The annual business meeting headed the agenda for the afternoon of Jan. 12. At this meeting reports of the various technical activities committees were presented by chairmen of the various committees involved. A particularly outstanding report was made by M. R. Gerow, Reynolds Metals Co., chairman of the Professional Activities Committee, covering the past year's activities as well as those projected for 1950.

Quality Control

Teeing off with the opening address at the afternoon Technical Section was Jerome Formo, Minneapolis-Honeywell Reg. Co., who was introduced by moderator G. E. Field, B. F. Goodrich Chemical Co. Mr. Formo read a report on a study which had been undertaken by the Society's Quality Control Committee. Examples of the effect of quality control such as that used at Minneapolis-Honeywell were cited. At that plant, a terminal block was showing a high scrap rate, and a study was made to determine the cost of the breakage. It was shown that breakage caused 90% of the

scrap, and that over half of this breakage occurred in a thin wall near the gate. It was further found that one of the three molds producing these parts had no breakage at all. On checking the parts made from the three different molds it was discovered that a variation in wall thickness of only 0.005 in. existed. Changing the molds to bring this thin wall section up to the top limit reduced breakage to practically zero. Mr. Formo reported that Amos Molded Plastics, Consolidated Molded Products Corp., and General Electric Co., either had installed quality control or were putting it into effect.

Mold Making

New trends in mold making were analyzed by J. L. Morrison, Detroit Mold Engineering Co. He stated that larger die sinking machines, such as Cincinnati's Hydro-Tels, and more fully automatic machinery such as Gorton's new electric duplicator are coming into wider use. The new steels developed since the war specifically for plastics molds have had a great deal of influence on the quality of molds being produced today.

H. A. Meyrick, Industrial Mfg. Corp., pointed out that mold design from the standpoint of temperature control was probably as important as from the standpoint of accurate dimensions and proper mold finish. He explained the use of his company's Thermolater, a device which is available to do a complete job of mold temperature control. Not only will this unit drain heat from one section of a mold, but at the same time it can be adjusted to add heat to another section. Temperature control, it was pointed out by the speaker, is probably one of the most important variables affecting the quality and dimensional accuracy of injection-molded parts.

The program continued with W. P. Gobeille, of Nash-Kelvinator Corp., discussing his company's experience with restricted gating for large injection-molded pieces. Mr. Gobeille remarked that his firm originally used large sprues, heavy runners, and a heavy fan gate in attempting to produce strain-free large area parts. Encountering many difficulties in this method of operation, Nash set up a development project to evaluate the possibility of using a restricted type of gate. With the speed of operation obtained with restricted gates, wattage had to be added to all chambers. This was not needed to deliver hotter material to the restricted gates, but rather to increase the plasticizing capacity of the injection equipment to take advantage of the shorter cycle possible with restricted gating.

Mr. Gobeille cited several examples of various parts which are now being produced strain free due to the use of restricted gating techniques.

Banquet Speaker

Over 350 members and their guests attended the official Society of Plastics Engineers banquet, Thursday evening, Jan. 12. After the presentation of awards for prize papers and the introduction of the new officers of the National organization, Dr. Howard E. Fritz, vice-president in charge of research of B. F. Goodrich Co., was introduced as the speaker of the evening. Declaring that the "right to think" is the sixth sense of humans, Dr. Fritz said that the foremost research problem now facing this country is to contribute more to the stockpile of basic and fundamental scientific information by the process known as "pure research."

"This country has taken the world's supply of fundamental scientific knowledge as a gift, and has gone further in applying it than any other nation, but has in itself contributed very little else," said Dr. Fritz. "Now, with many areas of the world operating in secrecy, and thus depriving us of knowledge that previously came, our pure research and its consequent contribution to the stockpile of knowledge must be second to none."

The future of everyone is being shaped in today's laboratory equipment, which is far removed from the simple contrivances with which the early inventors, such as Edison, created their products, Dr. Fritz declared. To explore today's great areas of research on the atom, supersonic fluid flow, and many other problems, requires complex scientific tools and facilities, he said.

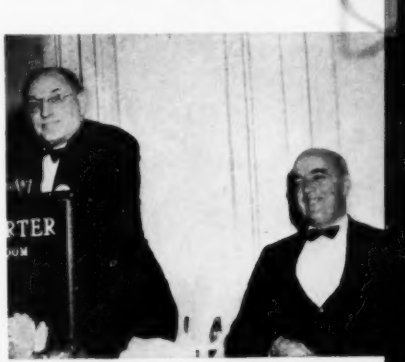
Dr. Fritz went to say that reliance in this country must be placed on the output of scientific minds, rather than on illusory ideas of security for everyone. "Man has struggled through many centuries of despair and destitution before the 'right to think' was finally granted him, and if he surrenders that right for paternalistic benefits, the sun will begin to set on the greatness of this nation," he declared.

Extrusion

The final meeting of the Technical Conference was devoted entirely to the subject of extrusion and extrusion machines. Mr. Orr introduced M. S. Greenhalgh, of General Electric Co., who spoke on the needs of extrusion. He stated that every development chemist, process, methods, or manufacturing engineer who is connected with extrusion in any form of either plastic or rubber compounds is aware of the need for proper and efficient extrusion equipment. The advent of vinyl compounds caused the extrusion business to grow by leaps and bounds, and extrusion equipment has made great advances over the old rubber extruder. At the same time, vast improvements have been made on the plastic compounds themselves.

Mr. Greenhalgh voiced the thought, however, that there are still many questions unanswered in the realm of determining what is the most efficient extruder design. He claimed that there exists a great need for additional improvement in the fundamental design of such parts of the extruder as the screw, size and external contour of head, size and shape of feed hole, center-

(*Continued on page* 168)



Dr. Howard E. Fritz
Speaker of the evening

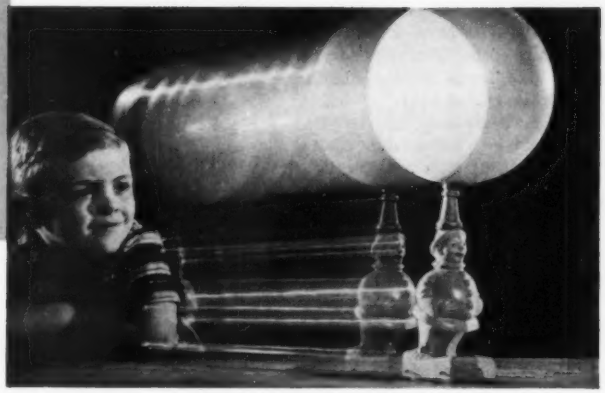
Todd Clark
listens

VARIETY—*The*

Two-ft. high inflatable vinyl Cubby Comeback toy is designed especially for the two to six age group. It can be ridden, used as a water toy, or used as a punching bag which rights itself after each blow. This versatile toy is made of Vinylite film by Marty Gilman, Inc., Gilman, Conn.

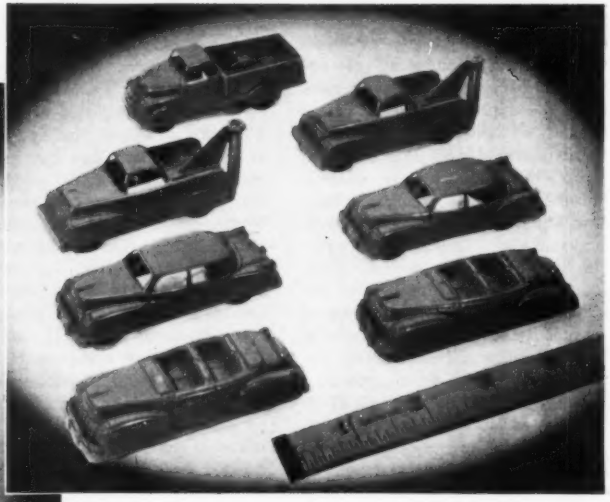
All-polystyrene Keymonica is a cross between a clarinet, a harmonica, and a button accordion. Ten keys regulate the tone of 20 notes in the key of C diatonic scale. Reed section is molded. Toy is made of Bakelite polystyrene by Magnus Harmonica Corp., 439 Frelinghuysen Ave., Newark, N. J.

COURTESY BAKELITE DIV., UNION CARBIDE AND CARBON CORP.



COURTESY HERCULES POWDER CO.

Jet propulsion is adapted to toys like Blo-Go, a clown which is driven by air escaping from an inflated balloon attached to the dunce cap of the 7-in. high clown. Sturdy balloon can be inflated through a hole in the back of the toy. Molded of Ampacet cellulose acetate and painted in gay colors by Hobby Model Mfg. Co., 149 W. 24 St., New York, N. Y.



COURTESY CELANESE CORP. OF AMERICA

Thanks to the economies of mass production injection molding, a nickel can still buy a toy car or truck. The colorful toys measure a little over 2 in. long and are good replicas of their full-size counterparts. Molded of Lumarith cellulose acetate by Consolidated Molded Products Corp., 309 Cherry St., Scranton, Pa., for Manoil Co., Providence St., Waverly, N. J.

Trend in Toys

New toys emphasize variety in plastics used, variety in conception, and variety in design

AS THEY DO each year, toy buyers from all over the world are gathering in New York on March 6 through 17 for the annual American Toy Fair. About 1200 manufacturers are exhibiting their products, and if last year's attendance is equalled, it is expected that 10,000 buyers will attend.

It is virtually impossible to count

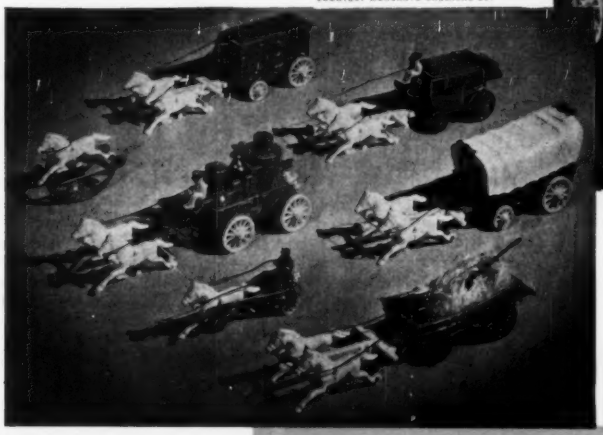
COURTESY HERCULES POWDER CO.

Champ, the performing pooch, can be made to wiggle his ears, wag his tail, sit up and beg, or even bark. The 6-in. toy dog is molded of Gering cellulose acetate. Legs, head, and tail are movable and are controlled by an operating handle at the end of a 30-in. flexible wire leash. The toy is made by Precision Specialties, Inc., 212 N. Western Ave., Los Angeles, Calif.

COURTESY HERCULES POWDER CO.

Horses drawing wheeled toys are geared to "gallop" when wheels turn. Horses and top of covered wagon are molded of Nixon cellulose acetate; wheels and vehicle bodies are Lustrex polystyrene. Hardy Plastics & Chemical Corp., 1 Junius St., Brooklyn, N. Y.

COURTESY MONSANTO CHEMICAL CO.



COURTESY HERCULES POWDER CO.

The old and the new are ingeniously combined in the K-Jet. It is a cross-bow which shoots rubber-tipped arrows, and has all the fascination of that old standard toy. Its shape gives it the added glamour of a modern jet plane. The handle is removable. K-jet is molded of cellulose acetate by Kenton Plastics Co., Marseilles Rd., Kenton, Ohio

COURTESY CELANESE CORP. OF AMERICA

Painting set has re-usable "canvas" made of Lumarith cellulose acetate sheet. Permanent black outlines printed on the sheet are colored in with water soluble paints, which can be easily washed off to ready the "canvas" for reuse. The durable cellulose acetate sheet "canvases" are fabricated by Kid-E Art Mfg. Co., 1345 Winder St., Detroit, Mich.

the number of different toys which will be shown, but it is safe to predict that a large proportion of them will be plastic. According to many experts, plastics account for roughly 40% of the total toy business, which amounts to around $500 million a year (at retail value).

Many of the plastic toys on exhibit at the 1950 Toy Fair have already been described in this magazine.[1] A variety of others, introduced to the market in the past year, are shown on these pages. The toys illustrated are by no means all of the new plastic toy items which will be shown. They are, however, representative of the many new and ingenious products of plastics toy manufacturers.

[1] See, especially: "Toys Can Be Different," MODERN PLASTICS 26, 61 (July 1949); "Toys," MODERN PLASTICS 25, 75 (May 1948). See also the article "Toys," (pp. 86-95) in the "Plastics in Use" section of the *1949 Modern Plastics Encyclopedia*.

COURTESY CELANESE CORP. OF AMERICA

The Paddle-Ball toy, long a favorite in wood, is now being produced less expensively and more safely in plastic. The paddle is molded of Lumarith cellulose acetate. The toy is made by Paramount Mfg. Co., Leominster, Mass.

Accurate detailed 1/20 scale models of New Idea farm equipment are molded of colorful Tenite I cellulose acetate. Topping Models, Inc., 106 N. Main St., Akron, Ohio, makes the models; Majestic Molding Co., Elyria, Ohio, molds parts

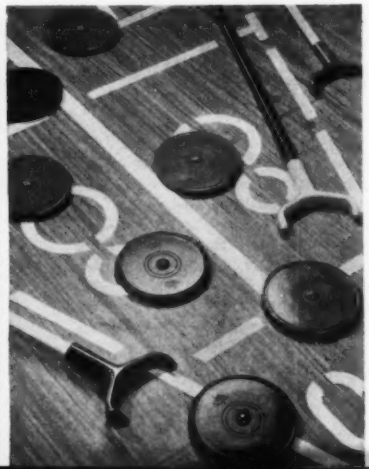
COURTESY TENNESSEE EASTMAN CORP.

The famous Kewpie dolls of two decades ago have been reincarnated in plastic. They are made in male and female versions, both molded of Tenite II cellulose acetate butyrate. The plastic dolls can be washed easily and are practically unbreakable. Made by Cameo Doll Co., Port Allegheny, Pa.

COURTESY TENNESSEE EASTMAN CORP.

Shuffleboard set of eight disks and four shovels, all in junior size, is made of Tenite II cellulose acetate butyrate. The plastic parts are light, have high impact strength, and their colors will not wear off. The set is made by Sandee Mfg. Co., 5050 Foster Ave., Chicago, Ill.

COURTESY TENNESSEE EASTMAN CORP.



S.P.I. Reinforced Plastics Conference

THE biggest registration in the organization's history, almost 100% attendance at the sessions, and a display of low pressure products featured the Fifth Annual Technical Session of S.P.I. Reinforced Plastics Div. at the Cleveland Hotel, Cleveland, Ohio, Jan. 10, 11, and 12.

Silicone and Glass

The first technical session was under the chairmanship of Harold Freeman of American Cyanamid Co. Dr. Jesse Plummer of Glass Fibers, Inc. discussed "Unwoven Parallel Glass Fibers and Silicone Laminates." Since costs of laminates and properties of finished laminates are directly related to the quantity of glass in a laminate, it becomes necessary to get maximum glass content in many cases. With glass fabrics, a laminate glass content of 60% can be obtained; with glass mats, 50% glass content; with random fibers, 35% glass content. Parallel fibers, however, make possible a big increase in the quantity of glass used. It is also possible to lower costs by the use of parallel fibers, and because of the position of the fibers, stress can be applied in a given direction.

Dr. Plummer's paper reported on an experiment begun as a development contract for the Navy Dept., Bureau of Ships and continued in his laboratory.

One problem encountered was the placing of sufficient resin on the fibers to hold them together. Another was the difficulty in laminating caused by the shrinkage of the resin itself. It was found necessary to partially impregnate the sheets and cure them until the bulk of the shrinkage had occurred, later adding further coats of resin with an additional curing operation. Further work is being done to reduce the effects of shrinkage.

Preforms

"Glass Fiber Preforms" were discussed by C. D. Jones of Structurlite Plastics Corp. The principle of glass fiber preforming was outlined and the machinery necessary was described.

Problems of Reinforced Plastics

Some of the discussions at the Technical Session, reported here, covered:

Shrinkage effects in glass-resin laminates.

Adaptability of glass fiber preforming.

Plaster tooling in reinforced plastics molding.

Problems of the Quartermaster Corps.

Mechanical and other properties of laminates.

Molds for large-area pieces.

Tooling requirements for high production.

Choice and use of mold parting agents.

A case history of mass-production of a unit containing 35 plastic parts.

In general, preforms should be used for relatively big parts ranging in size from one or two square feet up to about 12 square feet in area.[1]

On the subject of preform binders, Mr. Jones referred to phenol formaldehyde in powder form or in alcohol or water solution as easy to handle but presenting color difficulty. A water solution of urea formaldehyde does not provide sufficient moisture resistance for outside exposure. Polystyrene emulsion binders tend to leach out into and through the polyesters. A combination solution of one part polystyrene and three parts of urea formaldehyde improved the fiber wetting, resulted in more translucent moldings, and gave better moisture resistance to finished articles. Mr. Jones mentioned a new and promising type of binder, a powdered polyester resin which can be dusted on the preforms.

Tooling

The use of plaster tooling in reinforced plastics molding was discussed by M. K. Young, United States Gypsum Co. Quick and inexpensive pattern making, accuracy and dimensional stability, adaptability to complex contours and shapes, and small investment for tool and shop equipment are advantages of plaster in model making.

Gypsum cements have been used as molds for reinforced low pressure plastics for boats, aircraft air ducts, torpedo war-head housings, luggage, and custom-built automobiles.

Military Problems

Luncheon on Jan. 10 was under the chairmanship of William B. Darling, Riegel Paper Corp. "The Use of Reinforced Plastics to Solve Quartermaster Problems" was discussed by Dr. R. W. Ehlers, head, Plastics Compositions Unit, Research and Development Branch, Military Planning Div., Office of QM General.

QM items which have been made from reinforced plastics are packboards, skipole rings, serving trays, sled boats, tropical helmets, snowshoes, table tops, skis, bread boxes, and trunk lockers. Materials and molding methods were discussed.

Dr. Ehlers reported that the following factors would give impetus to the use of reinforced plastics in the QMC: the standardization of items; lower material costs; lower cost of procuring samples for testing; development of large scale production methods; and accurate cost methods projectable from development work to procurement.

Properties

Dr. Gordon M. Kline, Organic Plastics Section of the National Bureau of Standards, reported on "Investigations of the Properties at the N.B.S.". These investigations were done under the sponsorship of the National Advisory Committee for Aeronautics. They covered: 1) mechanical properties of laminates at —70° F., 77° F., and 200° F.; 2) effect of temperatures up to 700° F.; 3) effect of laboratory and outdoor aging tests on laminates; 4) effect of immersion in fuels on laminates.

Molding Processes

The opening session on Jan. 11 was a symposium on molding processes, the chairman for which

[1] See "Wood Waste Moldings Find New Markets." MODERN PLASTICS 27, 90 (Oct. 1949).

was W. Burdette Wilkins. Dr. Irving E. Muskat, Marco Chemicals, Inc., spoke on "Large Area Moldings" with special reference to the use of liquid, self-curing thermosetting resins in producing boat hulls, decks, caskets, and other large molded laminated parts. The procedure outlined by Dr. Muskat[2] involves the use of wood, concrete, or plaster male molds and a flexible female mold made of glass cloth and polyester resin.

The use of matched metal positive pressure dies in low pressure molding was discussed by Robert S. Morrison, Molded Resin Fiber Co.

There are several good reasons for making this type of die with its flame-hardened pinch-off, case-hardened guide pins, expensive machining—dies requiring 100-200 p.s.i. pressure and taking almost as much power to open the dies as to mold the part. High pressure on the resin prevents the styrene in the resin from boiling, eliminating pits and blisters. Air will be forced out of an impregnated mat when dies are slowly closed with high pressure. The use of inexpensive inert inorganic fillers to extend the resins and reduce costs is made more practical with the use of pressure in matching molds. Shrinkage in the mold is minimized; by using resins which cure completely in the mold, close dimensional control is obtained with the metal dies. Highly polished dies are easily cleaned with an air blast; parting agents are seldom needed.

Drawbacks to this type of die are: a) high die costs which may be amortized only on long runs; b) difficulty in estimating die costs; c) high expense in making changes in the dies; d) heavy, strong presses needed to close and open dies.

Molding Plant Equipment

"High Production Tooling" was discussed by W. Brandt Goldsworthy, Industrial Plastics Corp. "Capital equipment in the reinforced plastics industry today," said Mr. Goldsworthy, "is of the type that reflects great credit on the molder's ingenuity, but little on his balance sheet." A high production reinforced plastics molding plant should have: first, a piece of fiber-handling equipment such as a preformer; second, proper press equipment. Press manufacturers and molders should get together on modification of existing automatic and semi-automatic presses in this field.

There is a growing necessity for large area, perfectly matched dies at reasonable cost. Since a casting alloy cannot as yet be produced with no shrinkage and with sufficiently high physical and thermal properties, the development of other existing mold-making processes must be considered. Among these is the electroforming of matched dies from nickel or acid copper.

There are a great many reinforced plastics articles that can be run in dies produced by standard die-sinking techniques. In general, the price of this tooling is comparable with standard compression molding dies, and now that the industry is in mass production on some reinforced plastics items, the stymie of tool costs may not loom as importantly as in the past.

Savings in this industry must come from labor cost, and labor costs are directly proportional to the speed of the molding operation. The key to that speed is good tooling.

Others who spoke on the molding processes symposium were M. H. Orbaugh, Bone Engineering Corp., L. L. Shailer, B. F. Goodrich Chemical Co., and Gene Vidal, Vidal Co.

The Wednesday luncheon was under the chairmanship of W. Brandt Goldsworthy. Reporting for the Standards Committee was its chairman, Leonard S. Meyer, Western Products, Inc. Mr. Meyer's committee included Dr. D. G. Patterson, American Cyanamid Co., on resin standards; William B. Darling, Riegel Paper Corp., on paper standards; and C. E. Bacon, Owens-Corning Fiberglas Corp., on glass standards. Up to the present time, the committee has devoted its time to assembling test methods for the evaluation of raw materials used by the reinforced plastics industry.

Markets

Present and future markets for reinforced plastics was a subject shared by William B. Darling, manager, Plastics Div., Riegel Paper Corp. and Hiram McCann, Editor of MODERN PLASTICS Magazine — Mr. Darling speaking on flat laminates, Mr. McCann considering aspects of molded products and components.

At the annual banquet of the organization, toastmaster was Robert J. Brinkema. Speaker was Dr. Tennyson Guyer.

Parting Agents

On Jan. 12, two technical sessions were held, the first under the chairmanship of Leonard S. Meyer, Western Products, Inc. James S. Lunn, Lunn Laminates, Inc., presented a comprehensive analytical paper on molding parting agents.

Mr. Lunn pointed out that the selection of the right parting agent is not enough: specifications of the process for its use must be established by experimentation. The choice of a parting agent depends on: a) the type of mold material and its surface finish; b) the type of laminating resin or varnish to be used, together with the pigments, fillers, and reinforcing materials; c) the finish and hardness required on the molded item; d) the molding pressure and temperatures involved; and e) the ease of application of the parting agent and the frequency with which it must be re-applied.

Mass Production

A magnificent case history of mass production of reinforced plastics was offered by Arthur J. Wiltshire, Apex Electrical Mfg. Co. in his paper, "Assembly, Machining and Mechanical Finishing of Reinforced Plastics Products". Mr. Wiltshire's paper disclosed the experiences of his company on the assembly of a balance ring for an automatic washing machine containing 35 parts. Cements, cementing methods, and precautions were discussed on cemented joint areas totalling 96 square inches. The final joints had a strength of 10 tons in shear for a 50-sq. in. joint and 18 tons in shear for a 46-sq. in. joint.

Electrical Uses

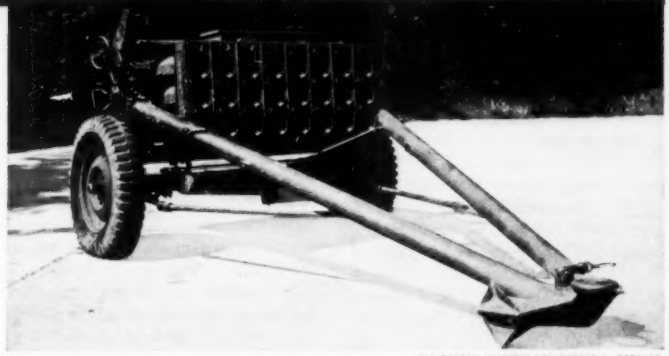
"New Horizons for Fiberglas and Polyesters in the Electrical Field" were discussed by Roger B. White, Laminated Plastics, Inc. Mr. White pointed out that well over 50 million lb. of high pressure laminated phenolic sheet stock are used annually in the electrical field and that it is not entirely satisfactory in a great many applications. Thus, big oppor-

(*Continued on page* 167)

[2]See "Success is in Sight for Reinforced Polyesters," MODERN PLASTICS 27, 69 (Oct. 1949).

Construction of a plastic laminate shield to protect personnel in the vicinity of rocket launcher (right and below) from flame is a major objective of Ordnance Department

Modern Ordnance Problems— *A Challenge to Plastics!*



ALL PHOTOS COURTESY DEPARTMENT OF DEFENSE

by **LUCIUS GILMAN**

WEAPONS and combat equipment for soldiers are designed, developed, and supplied by the Army Ordnance Department. The list of items involved is long. It includes artillery weapons, small arms weapons, rockets, ammunition of all sorts, bombs, mines, hand grenades, combat vehicles such as tanks, transport vehicles, and fire control equipment for the aiming of guns. A list of the problems involved in this operation would be even longer—and many of the problems in modern Ordnance are problems involving plastics.

The Author

With a B.Sc. in chemistry from the University of Illinois and a Ph.D. from McGill University in Canada, Dr. Lucius Gilman spent seven years in industrial research in synthesis of polymers, development of polymers for injection molding, and selection for specific application. For the past seven years, he has been Chief, Ordnance Department Plastics Laboratory, Picatinny Arsenal, located at Dover, N. J., specializing in investigations of mechanical properties of plastics and in selection of plastics and other polymerics for severe utilitarian uses.

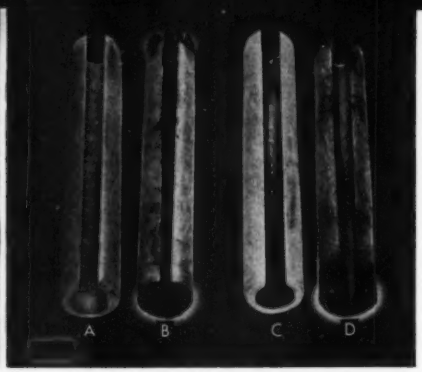
Artillery weapons such as field and assault guns pose a problem of protection of operating personnel and nearby equipment from the blast of the gun. A shield or screen is required in some instances to deflect the blast and the hot gases at the time the gun is fired. In one specific group of applications a plastic deflector plate would mean an important saving in weight, and the plastic material would not become as hot to the touch after successive firings as would a metal plate.

Any plastic to be used in this application would have to have a high resistance to delamination from the blast of hot gases, and would also have to have a high degree of resistance to erosion by the action of these gases. We would not expect most organic polymers to show these properties, but we know from other work we have completed that even combustible polymers like phenol-formaldehyde can be used as binders for laminates that will withstand erosion from propellant gases if the filler of the laminate is noncombustible. Laminates made with asbestos paper or asbestos fabric as filler have shown a high degree of resistance to erosion by the hot gases, in spite of the fact that the resin binder itself was not flameproof or fireproof.

The main difficulty to date has been in locating a material which will have the requisite flexural strength combined with the desired lightness in weight. In addition, the surface must be sufficiently tough to resist serious cutting or pitting due to small particles of solid metals which are occasionally carried along by and are driven by the propellant gases. Since the total construction should preferably show a marked saving in weight over a steel shield of the same strength, we would expect that the final construction

Adapted from a paper presented at the S.P.I.—Armed Services Meeting, Washington, D. C. The opinions or assertions contained herein are the author's and are not to be construed as official or reflecting the views of the Army Ordnance Dept.

Plastic butt stock for automatic rifle requires additional reinforcement. Tests conducted on fully assembled weapon produced above results: a) new stock before testing; b) after side impact test; c) after end impact



Aluminum foil in plastic laminate is one answer to rifle hand guard problem: (a) and (b) without foil before and after firing; (c) and (d) with aluminum

might consist of a plastic surface with a metal frame or plate.

Igniter Requirements

There is a class of Ordnance applications for which a variety of compositions—consisting of paper and polyethylene or fabric and polyethylene laminated together—would seem to be the best material. Every rocket and every round of artillery ammunition contains what is called an igniter. This igniter is a charge of black powder whose function it is to ignite the main propelling charge of smokeless powder which then drives the rocket or artillery shell. The igniter bears the same relation to the smokeless powder as the head of a match to its stick.

These igniters vary considerably in size and shape according to the rounds in which each is used. Current designs include igniters as small as a nickel and others which are as large as a soup bowl.

The chief requirements for a material to be used in igniter cases are: combustibility and/or friability; mechanical toughness over temperatures ranging from sub-zero as found in the Arctic to those encountered in desert storage; low moisture permeability; resistance to nitroglycerin; and the ability to be sealed safely in the presence of black powder. Polyethylene meets most of these requirements and will probably be used in a number of igniters. One of the special advantages of polyethylene is that it can be sealed at temperatures from 230 to 250° F., a temperature low enough to be used safely in the presence of black powder.

However, in some of these applications, polyethylene film fails because it has insufficient cut resistance, insufficient resistance to puncturing, or insufficient resistance to abrasion. In addition, polyethylene is unsatisfactory in some applications because it fails to burn completely under the conditions of time, temperature, and pressure when certain types of ammunition are fired.

In general, we have found that laminates of polyethylene with paper or with fabric show great improvements in all these respects. Improved resistance to cutting, puncturing, and abrasion would be expected, but the improved combustibility was a pleasant surprise which we had not anticipated.

What, then, is the problem? It consists of getting a variety of polyethylene-paper and polyethylene-fabric laminates for a variety of different specific applications. Up to the present, we have been able to find sources of polyethylene-paper laminates in which heavy grades of paper are employed; but we also require laminates in which very thin grades of paper are used, and we have not been able to find sources either for this type of polyethylene-paper laminate or for any polyethylene-fabric laminate.

It must be pointed out that none of these has yet been tested to final conclusion; hence work would still be required, and this may involve decisions as to choices of materials and constructions.

Desiccant Containers

An application of a somewhat similar sort is that of a desiccant

Ammunition igniters, varying in size and design, are polyethylene containers for black powder. Existing problem is insuring film seal at low temperatures

bag container. The desiccant is most often silica gel, and containers made of this fabric were used during the war. The objection to this type of bag is that dust and fine particles from the silica gel sift out. The principal requirements are good mechanical properties over a wide range of temperatures, and high moisture permeability. This last characteristic is, of course, the reverse generally desired in plastic sheeting or polymer-coated fabric. It just goes to show that if a product does not have the properties required for the big civilian market it may be exactly what the Ordnance Department needs. Sooner or later we seem to be called upon to provide every combination of properties that can be imagined.

There are few if any continuous plastic films which can be expected to combine as high a rate of moisture-vapor transmission as we need with the mechanical toughness required. We shall not be surprised if it is necessary to use either polymer-coated paper or polymer-coated fabric. In this case, the paper or the fabric would provide the necessary dust-tight layer. Holes as large as 0.00004 in. could be permitted but no larger.

The difficulty thus far has been in obtaining samples of coated paper or coated fabric for testing. We can get numerous samples of vinyl- or polyethylene-coated materials made for the civilian market, but these, of course, have low moisture vapor transmission rates. What we need would seem to be paper, or fabric coated with ethyl cellulose acetate, or possibly with polyamides or some other polymer which could be expected to show a high moisture-vapor transmission rate.

Tank periscope elements of glass and plastic need improved adhesive

Ends for Tubing

We still need a method or construction technique for putting ends on glass-base laminate tubing to obtain high resistance to internal pressure. It is generally known that glass-fabric-base laminated tubing can be made with a high tensile and high bursting strength relative to its weight; but this tubing cannot be employed for containers with high internal pressure because there is no practicable and economical way of putting on end closures. Threaded end closures are blown out at pressures which are very low relative to the bursting pressure of the tubes themselves. Efforts to cut and tailor the fabric of the side walls to make a formed end closure have not been successful. In addition, end tailoring methods do not seem to be attractive for production in large quantities.

The solution to this problem could take either of two forms. A method for attaching an end closure might be devised which would avoid loading a side wall laminate in shear, or else a glass-fabric laminate might be developed with sufficiently high shear strength to permit it to carry the necessary shear load satisfactorily.

Jeep Side Curtains

We need better material for windows in side curtains of jeeps and for other automotive equipment. The material should be tough at temperatures as low as —65° F., have high transparency, and preferably have high resistance to abrasion and scratching. Cellulose nitrate increases the fire hazard. At present, the best usable material is cellulose acetate sheet, the most serious disadvantage of which is its relative brittleness at lower temperatures. If you have something that is equal to cellulose acetate in transparency, and in resistance to abrasion and scratching, and is superior in toughness at low temperatures, we would be interested in examining it further.

Military Developments and the Civilian Market

An important advantage of participating in military developments will often be the improved technique or the increased knowledge which these developments provide for attacking subsequent problems for civilian production.

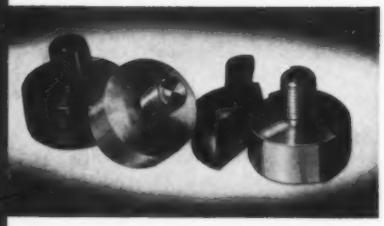
As examples, the adjacent paper lists military needs for extruded tubing of considerably increased size and for polyethylene heat seals of increased reliability. Any fabricator who solves either of these problems will thereafter have improved techniques at his command for use in connection with items for the civilian market. It will be recalled that practically all of the early work in solving extrusion problems with polyethylene and in developing post-forming techniques for thermosetting laminates was performed in connection with military developments. That accumulated experience is used today in handling polyethylene or post-formed laminates for civilian end items.

The prospect of direct profit on military items which are under development is not always promising, but almost every successful military development that is worked out will lead to improvement in the developer's position in civilian markets.

A proposed new material does not have to be perfect in the desired characteristics to be worth consideration; we would be glad to have an improvement over the best currently available material even if the improvement falls short of the ideal.

Heat Sealing Polyethylene

Materials suppliers or one of the fabricators may be able to solve a problem concerning polyethylene sheeting. We need a method by which we can know that polyethylene has been properly heat sealed. We know that heat-sealed seams will have adequate mechanical



Protective dip coatings would find wider military use if lower application temperature were developed

strength providing the heat sealing is performed at a sufficiently high temperature, while a seam formed at a slightly lower temperature will peel apart very readily and will be very weak.

In most instances, after the seal has been made, it is impossible to determine by visual examination whether or not complete fusion of the polyethylene was obtained; the only way to test for a strong seam is to pull it apart. This method is obviously unsatisfactory. We need a non-destructive test or method of examination which will permit 100% inspection of polyethylene heat seals.

Large Tubes

The Ordnance Dept. has been using tubes of from 4 to 10 in. in diameter with ⅛ to ¼ in. wall thicknesses which is prepared by rolling up cellulose acetate sheet 0.010 in. thick to make the required sizes. This method of tube preparation is expensive and is not entirely satisfactory from the point of view of mechanical performance. There is a demand for extruded cellulose acetate tubing in diameters of from 4 to 10 in. with wall thicknesses of from about ⅛ to ¼ inch. Some tubing of these dimensions has been made by extrusion, but additional sources are desired.

Dip Coatings

A prospective outlet for polymers which cure at room temperatures exists in dip coatings applied at those temperatures. The hot melt dips which were employed during the war for the protection of metal parts in storage were usually applied at 325 to 375° F. For many uses in which a protective coating is required, only room temperature applications can be employed. The principal requirements are: 1) application at 120° F. or lower; 2) single dip to produce a film thickness of 0.020 in.; 3) must protect steel, copper, and aluminum from corrosion at elevated temperature and high relative humidity; 4) must strip readily and freely; and 5) must have a film strength of about 600 p.s.i. with about 75% elongation to break.

Great Mechanical Toughness

The next two applications go together. The first is plastic hand wheels. The principal requirement is great mechanical toughness over the complete temperature range of —65° F. to +160° F. Polyester molding materials filled with glass fiber are under consideration for this application, and we know of two sources for this type of molding composition. If any readers have similar molding compositions or have other molding compositions with comparable mechanical toughness and moldability, we should like to know about them.

Related to the hand wheels are the bearing bushings for the corresponding hand wheel shafts. The bearings are required to sustain light loads only. The difficult requirements are good mechanical toughness from —70° F. to +200° F., ability to withstand exposure to +200° F. for several hours at a time, and, preferably, self-lubricating characteristics—all combined with good bearing characteristics. Nylon would, of course, seem a good choice except for possible deterioration at 200° F. Phenol-formaldehyde bearings have less of a self-lubricating quality. Since these two best known plastic bearing materials are somewhat deficient in the properties we require, we are open to additional suggestions.

Another problem concerns a replacement for or improvement on polymethyl methacrylate guides and followers for electrodes in chromium plating; they have been dimensionally unstable in the chromic acid bath. Polystyrene will be tried in place of polymethyl methacrylate, but other suggestions are welcome.

A technique is needed by which optically flat polymethyl methacrylate surfaces which will be free from stresses can be prepared. Watch and instrument covers are required which have the clarity and abrasion resistance of polymethyl methacrylate and of cast allyl sheeting, but which are superior to these materials in mechanical toughness, and which are flexible enough so that they can be bent more sharply than these two materials. Even greater abrasion resistance is required for other optical applications. At present, glass is being sealed to the plastic surface for this reason, but a plastic which does not need this protection would be well received; or in the absence of such a material, an adhesive for glass to plastic over temperatures from —80° F. to +150° F. could be used.

There are two additional specific problems associated with adhesives. One is to make an adhesive stick, and one is to make an adhesive unstick. A bonding agent is needed for fastening polymethyl methacrylate to glass and for fastening cast allyl to glass. The adhesive must be optically clear and must be usable over the temperature range of —80° F. to +160° F. In connection with unsticking, a practicable method of removing a cured adhesive of the GR-A phenol-formaldehyde type from metal is required. Ethylene glycol will remove the cured adhesive from glass but will not remove it from aluminum.

Guards for Guns

In rifles and other small hand weapons, plastics are of interest, because in hand guards and butt stocks they produce less finger chill in cold weather than do metals. A major additional requirement, of course, is high impact strength. To date, experimental plastic hand guards have had satisfactory low thermal conductivity and have been moderately satisfactory in impact strength, but have failed due to charring where the plastic guards are connected to the metal rifle barrel. The plastic rifle butt has been fairly satisfactory but has less impact strength than is desired. Materials or construction designs which would overcome these limitations would be welcomed.

An alternative approach is also receiving favorable consideration. This approach consists of using lightweight metals or sheet steel,

(*Continued on page* 168)

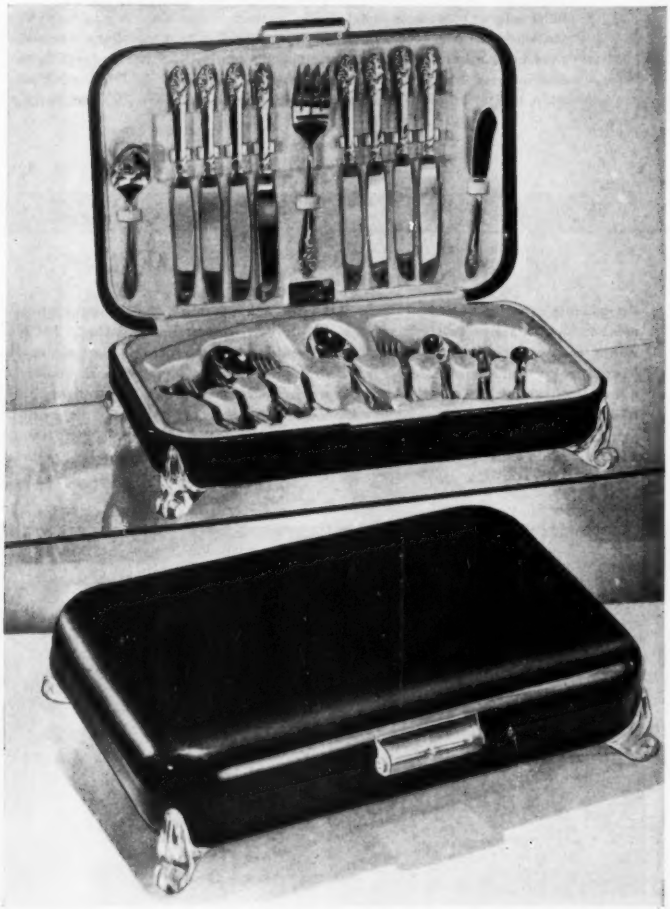
Silver Chest of Polystyrene

In what may set a standard in the silverware industry, traditional wood package is replaced by plastics for protection, display, and merchandising

A NEW silverware package—said to be the first injection molded unit of its size and kind—has been introduced to the market by Oneida, Ltd., Oneida, N. Y. Featuring the firm's recent campaign is its Community Evening Star pattern encased and displayed in a chest made of Lustrex polystyrene with interior accessories of polyethylene. Called the Dream Chest, the container, holding a 61-piece silver service for eight persons, provides protection, enhances both domestic and commercial display, and is adaptable to sales presentation.

In a departure from conventional wooden cases, Oneida has designed a chest measuring 16½ by 11 by 3½ in., molded by General Products Co., Inc., Central Falls, R. I. The chest's largest piece, the base, weighs 28 oz. The container's wall thickness is ¼-inch. Dies for the job were made by Special Tool and Machine Co., S. Boston, Mass., and General Molding Tool Co., Springfield, Mass.

Container for silver service set is made of polystyrene—has interior accessories of polyethylene. Four feet and cover lift are of clear polystyrene



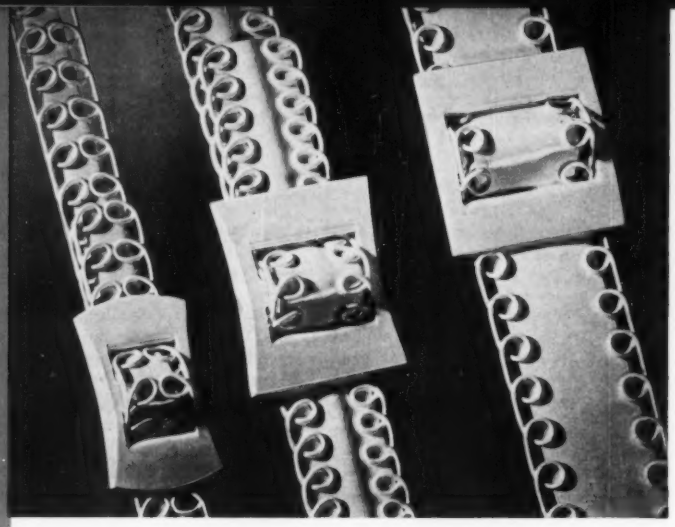
Although introduced in a special maroon shade, referred to as a deep wine red, the chest lends itself to color changes to conform to both store and home surroundings. Supporting the chest are four feet of crystal clear polystyrene. A cover lift is made of the same material.

Installed in the interior of the upper lid, which was designed by Paul M. Fuller, Inc., Oneida, N. Y., are a series of white polyethylene knife holders made by Thermold Corp., Clinton, N. Y. These accessories are attached to the cover pad by a washer welded to the butt of the holder with an electric contact. Both the cover and base pad are maintained in place by peach-colored pins also molded by General Products Co., and designed with a taper fit. When the pins are inserted in bosses, previously molded into the top and bottom of the container, it is virtually impossible for the pads to fall out.

Construction of the Dream Chest is aimed at protecting the silver against tarnishing. To make the container airtight, the bottom pad projects 3/16 in. above the chest sidewall, thus preventing the entry of free sulfur. In addition, the nesting fabric has been chemically treated with a tarnish-preventive formula.

Of particular interest to sales personnel is an arrangement whereby two lids, hinged together, form a salesman's sample case. Sales figures and dealer reception of the new chest are currently being given careful consideration to determine the future of the plastic container as a standard feature of this industry.

Plastics Products



Belts and buckles in matching colors are both made of plastic. The belts are extruded of vinyl, have extruded lace-like trimming. The matching buckles are injection molded of Tenite I cellulose acetate, thus have no metal parts to rust and no fabric coverings to fray. Belts and buckles are made in three styles and three sizes 1, 1½, and 2 in. wide, by Delano Shur-Grip Belts, 1401 E. Milwaukee Ave., Detroit, Mich.

Washable holster for toy pistol is molded in one piece of Du Pont polyethylene. The holster will not fade, scuff, or fray, and there are no seams to come apart. Design is molded-in to front surface of holster. Belt and thigh thong are extruded polyethylene. The holsters are manufactured by The Kilgore Mfg. Co., Westerville, Ohio

Rugged miniature AC outlet for equipment which must withstand rough usage has strong molded phenolic housing with solid back. Outlet requires mounting centers of 1⅛ in. and only 1 in. clearance behind panel. Made by Alden Products Co., 117 N. Main St., Brockton, Mass.

Wren house molded of Lustrex polystyrene needs no painting. It is molded in two pieces so that top can be removed for cleaning each year to ready the house for new tenants. A choice of six bright colors is available. Made by MacDonald Mfg. Co., 550 Green St., New Baltimore, Mich.

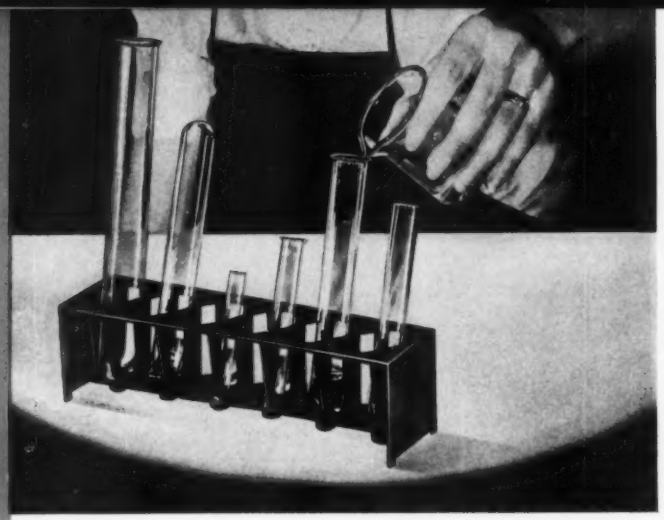
Ring of Styron polystyrene serves as "reel" for casting hand lines for fresh or salt water fishing. Ring is held at right angles to the direction of the cast, and the line pays out easily. Retrieves are made with hand-under-hand motion. The rings are molded by The Douglass Mfg. Co., Elyria, Ohio, for the Handicast Co., 316 Marion Building, Cleveland 13, Ohio

Two-part handle of purse-size brush snaps shut to become a match-book shaped case for the brush. Case is molded of Lumarith cellulose acetate, houses either a metal brush for suede or a bristle brush for hat and clothes. Brush is compact, light in weight, and can be imprinted for use as premium. Made by The Vogel Mfg. Co., Bridgeport, Conn.

New automatic humidifier to keep cigars or pipe tobacco fresh is molded of Lustrex polystyrene. Chemicals sealed inside the polystyrene compartment stimulate the flow of vapor when humidity drops in the box but prevents too much moisture from being emitted. Humidifier is designed to fit easily inside standard size cigar boxes or tobacco containers. It can be imprinted and used as premium or advertising specialty item. Molded by Tri-Mold, Inc., Kenmore, N. Y., and distributed by Cigar Life, Inc., 200 Oak St., Buffalo, N. Y.

Lettering guides are injection molded of Lucite acrylic. Rigid control of dimensions during molding insures accuracy of the finished product. Guides are tinted green for use on lighted boards. Molded by Pereles Bros., Inc., 2484 S. 7th St., Milwaukee, Wis., for A. B. Dick Co., 720 W. Jackson Blvd., Chicago, Ill.

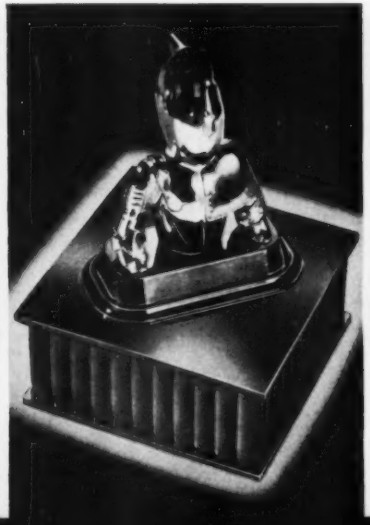
Plastics Products



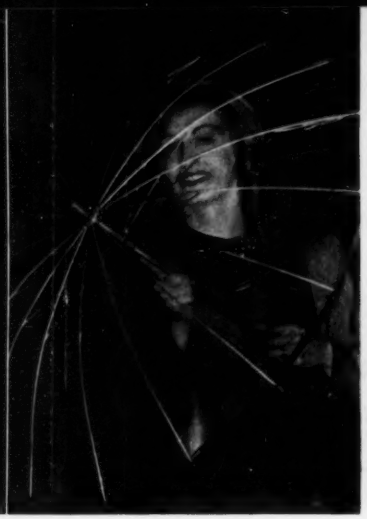
Phenolic test tube rack holds six tubes of varying sizes at a slight angle so that they can be filled easily. Bakelite phenolic material used to mold the rack is highly resistant to most chemicals and can be sterilized in an autoclave. Contents of each tube are visible right down to the bottom of the tube. Inverted tube can be placed in the rack and is uncontaminated by contact with a pin or peg. Each pocket will hold tubes from 2⅜ to 8½ in. long. Sold by Central Scientific Co., 1700 Irving Park Rd., Chicago

Batons extruded of Tenite II cellulose acetate butyrate serve as packages for ¾ oz. of candy, and as toys after the candy is consumed. Baton is 24 in. from red wood handle to cork stopper. Made by Patek Mfg. Corp., 157 E. 128 St., New York. Tubing extruded by Keystone Plastics, Inc., 5706 3rd Ave., Brooklyn

Cigarette box molded of Forticel cellulose propionate is topped by cigarette lighter in the shape of a knight in shining chrome armor. Propionate is used because of its dimensional stability and lustrous surface finish. The box is manufactured by Hamilton Art Metal Corp., Jericho Turnpike, New Hyde Park, N. Y.



Nursery table lamp has music box inside its Beetle urea base. It plays the Brahms lullaby and gradually dims the light, or it can be used as a regular lamp. Base is molded by Martindell Molding Co., N. Olden & 6th St., Trenton, N. J. for Wirt Co., 5221 Greene St., Philadelphia, lamp maker

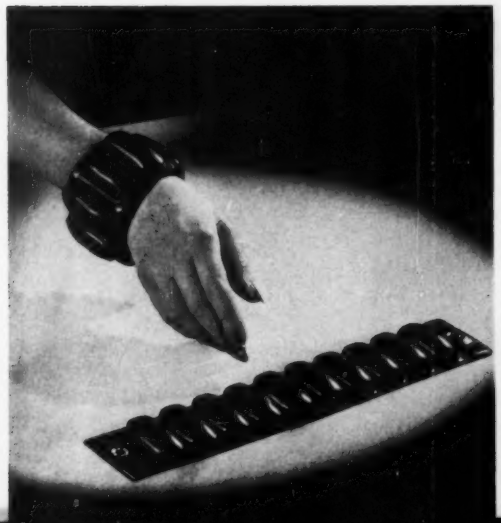


Umbrella covered with transparent cast Vinylite film allows the user to get an unobstructed view of traffic, prevents collisions in windy, heads-down-into-the-wind weather. The vinyl film has a delicate appearance but is actually sturdy, long-wearing, non-cracking. The handle of the umbrella, molded of polystyrene, holds fifty cents or more in nickels, dimes, and pennies so that the change is handy for bus fares or small purchases. Made with clear vinyl film and binding, handle in various color combinations, by Eichenbaum Umbrella Co., Inc., 298 Fifth Ave., New York

Knitters can keep their yarn handy with the Knit Bit, a Tenite II cellulose acetate bracelet with a shaft on which the yarn can be impaled. Molded by Central Molded Products Co., 5265 W. Grand Ave., Chicago, and sold by Gerard Co., 160 Green Bay Rd., Winnetka, Ill.

Lightweight cold pack to take the place of heavy, clumsy ice bags is made of 20-mil Vinylite film. Special solution is electronically sealed permanently inside the Freezo pack, can be frozen in refrigerator ice compartment. No filling or emptying is necessary. Liquid is sealed in separate compartments so that the unit is always flexible. The Freezo pack is made by Pioneer Valley Plastics Co., 22 Ryan Court, Springfield, Mass.

Washable, chip-proof, rust-proof bread box is molded of Lustrex polystyrene. Rounded corners and absence of seams or joints make the box easy to clean. Cover is easy to open; box is shallow when open so that all contents can be reached easily. The box is 13½ in. wide, 9½ in. deep, and 6½ in. high. The two parts are molded of white, red, or yellow polystyrene by The Plas-Tex Corp., 2525 Military Ave., Los Angeles, Calif.



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Engineering Drawings on Vinyl

Improved contact-printing process utilizes plastic sheet for reproduction on sensitized surfaces. Variations of method permit simple multiple duplication

IN THESE days of increasing industrial complexity, it is refreshing to uncover an occasional process so simple that it is downright ingenious. Such a process has been developed by McDonnell Aircraft Corp., St. Louis, Mo., where sharp, hairline engineering drawings are being reproduced directly on metal surfaces from vinyl sheets.

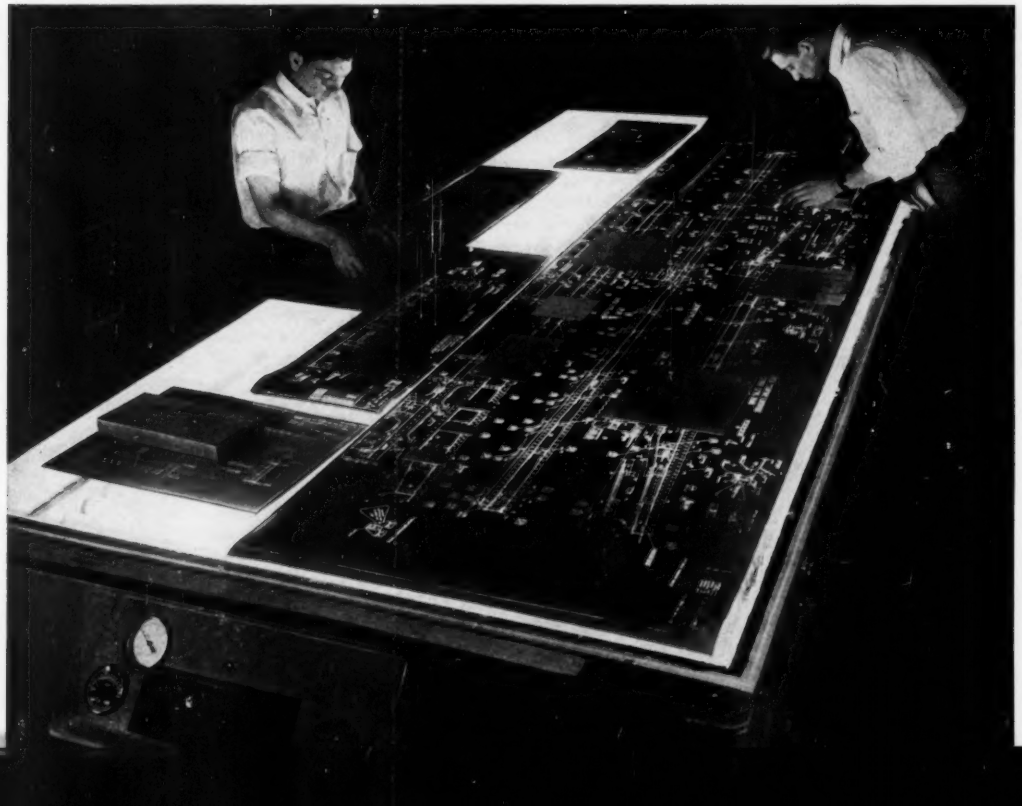
World War II was responsible for the elimination of complicated and expensive lofting processes by most manufacturers. The time-consuming transfer of original drawings to sheets of metal by hand quickly faded before the stepped-up tempo of wartime production. Most major companies went in heavily for projection methods of reproduction; others toyed with contact printing from inked drawings on translucent sheets.

Most companies today are still using a camera projection process whereby drawings are photographed on a sensitized glass plate and then projected through the plate on sensitized metal. This method involves a huge expenditure for room-sized cameras and other Gargantuan photographic equipment and gives rise to problems of handling and storing assorted sizes and shapes of glass plates. It has the advantage

*Reg. U. S. Pat. Office

Printing process is handled on large copyist machine on which etched lines in vinyl sheet stand out clearly. After plates of sensitized material are exposed briefly to light, design is "burned" directly on part and then is washed

ALL PHOTOS COURTESY MCDONNELL AIRCRAFT CORP.



First step in preparation is spraying of vinyl sheet with primer plastic base coat (left). Coat penetrates sheet and makes excellent working surface for scribing (right) which is done on pencilled layouts. Mistakes are easily corrected

of being able to produce prints of the original drawing reduced or increased to almost any scale.

The M.A.C. vinyl-sheet process is considerably more simple. Actual size drawings are prepared directly on processed vinyl material and are reproduced by an improved contact-printing process on form blocks, template stock, aluminum alloy sheet, or sheet steel. The drawings may also be transferred to other vinyl sheets by the same process.

Vinyl Preparation

First step is the spraying of clear vinyl sheet stock with a primer plastic coat consisting of yellow paint, toluol, and aluminum paste. This coat penetrates the vinyl sheet, becoming more a part of the sheet than a coating.

The prepared vinyl sheet has a surface that "works" very much the same as hard-finish drawing paper. Drawings are made in pencil in the original layout and then etched in with metal scribes. These scribes make hairline tracings and keep within the close tolerances of aircraft fabrication work. Mistakes may be easily "erased" by painting over the incorrect portions with some of the original paint. Repainted sections of the sheet can later be scribed.

The material on which the drawing is to be reproduced is first sprayed with black lacquer. Material is usually precut to the size of the finished part, although entire assemblies covering areas of up to 4 by 12 ft. have been reproduced at McDonnell in one operation. A Transfax sensitizer, made by Eastman Kodak, is then sprayed over the primer.

Several Coats

Three to four thin coats of the sensitizer have been found superior to one heavy coat. Drying is almost immediate, so the coats may be applied in rapid succession. The sensitized metal is then ready for exposure, although quantities of the material can be stored from 10 days to two weeks if kept in a cool, dry place without too much light. The Transfax sensitizer is not adversely affected by short periods of exposure to ordinary inside room lighting.

Copying

Large copyist reproduction machines are used at M.A.C. for printing the drawing on the sensitized metal surface. The company has experimented extensively with simplified equipment, however, which it recommends to service facilities. Excellent results have been obtained with an ordinary photo flood lamp which is passed over the sheet several times. A 45-sec. exposure to ordinary sunlight has also proved satisfactory.

Such a simple set-up consists of placing the sensitized metal sheet on a felt backing and covering with a scribed vinyl sheet. A piece of glass on top of the entire assembly will hold the pattern flat while the exposure is being made.

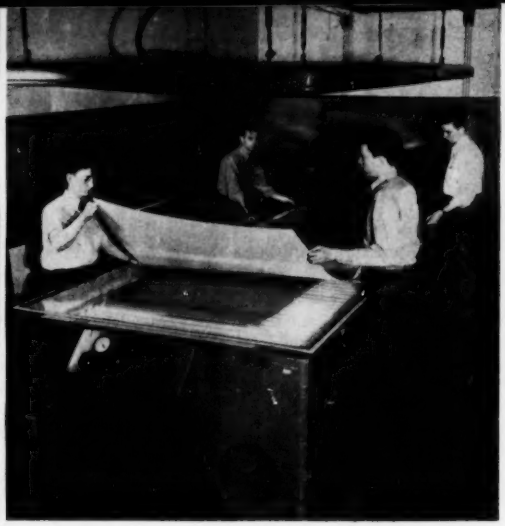
After exposure, the material is washed with a solution of warm water and sodium carbonate in 2% solution. This softens the sensitized coating which may be washed off under normal hydrant pressure. Just the exposed coating is washed off and, as the lacquer undercoating is black, the hairline design appears finely etched and clearly visible on the metal.

Earlier Methods

An earlier method of contact reproduction employed a simpler reversed process consisting of merely drawing a design in pencil or India ink on vinyl and exposing over a sensitized metal. The entire surface was then washed away, leaving the design lines etched in white on the metal. Other than the obvious disadvantages of lines getting smudged or obliterated during the process, they tended to reproduce too thickly and varyingly for close tolerance work.

Where vinyl drawings are subjected to heavy use, it is desirable to produce duplicates of the original. The clear vinyl sheet is first given a lacquer coat to provide a "tooth"

Black lacquer is first applied to material on which drawing is to be reproduced. Then thin coats of sensitizer are sprayed on



Copyist machine, which prints the drawing on sensitized metal surface, handles large reproduction jobs in single operation

for the Transfax. The printing process is the same in this case and the reproduction may be made either directly or in reverse. Reproductions can be made from the duplicate in the same manner as the original. The sheet may be dyed red or yellow to improve opaque qualities and distinguish from the original drawing.

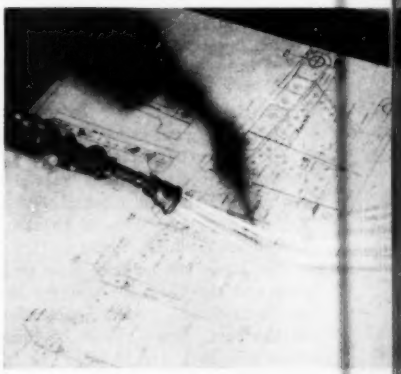
Negatives

It has been found that ordinary blueprint machines generate too much heat for satisfactory handling of vinyl sheets, so in instances where a large number of blueprints are needed, a copyflex negative may be printed from the original vinyl drawing. The blueprints are then printed from the copyflex negative.

The Transfax coating on the finished parts has proved rather tough and can be bent, sheared, or punched without flaking. Fabrication instructions or other printed matter may be etched on the original vinyl pattern and printed directly on each part.

Simplified Inspection

The vinyl system of reproduction as used in the aircraft industry has greatly facilitated inspection procedures. Instead of checking each part with devious and time-consuming measuring devices, the inspector merely lays the finished part over the pattern for an accurate check.



Washing removes exposed sensitizer, makes hairline design appear

New reproduction technique facilitates accurate inspection. Inspector checks fabricated part by laying the finished piece over original pattern

Hand trimming with a shear roughs out template upon which drawing has been reproduced from vinyl sheet

Tumbling Nylon Cams

Removal of flash and sharp edges on typewriter parts requires special tumbling technique

by HERBERT CHASE

WHEN International Business Machines Corp. redesigned its electric typewriter, it was decided that certain cams, of which 42 per machine are required, should be produced in nylon. This plastic, in a light cream color, was chosen because of its unusual strength and toughness, its light weight and stability, and its adaptability to production at moderate cost within close dimensional limits.

Each time a key on this typewriter is depressed, the corresponding cam has its serrated surface brought into contact with a continuously revolving rubber-surfaced roll. When this contact occurs, the corresponding type bar is tripped. Action has to be rapid and precise; cams must return instantly to off position as soon as the type bar is actuated.

There is always some friction applied to serrations on the cam-actuating surface when they meet and are withdrawn from the roll. Nylon has the toughness needed to resist the abrasion which results.

Two holes are molded-in in each cam and the die also produces the fine serrations in the contact edge of the cam. There are 29 of these serrations in a curved edge $^{29}/_{32}$ in. long. The molding is being done in a 16-cavity mold in which the temperature of each cavity is held within a 5° F. range. This mold has a thermocouple at each of the 16 cavities, and cavity temperature is controlled by oil flow through drilled passages.

To attain the stability needed and thereby hold the unusually close dimensions specified, it is necessary to inject the nylon at 410° F. rather than at the 380 to 390° F. temperature normally used with nylon of this grade. This makes the plastic unusually fluid and results in some flash, especially at pushout pins which wear more rapidly than with some other plastics. At the flat die parting which, for economy in mold construction, has to be at the front face of the molding, there is little or no flash, but the sharp or feather edge at this parting has to be removed.

Rigid Finishing Requirements

As tumbling is an inexpensive operation for which excellent facilities were available, it was decided to try tumbling the cams. Since nylon is unusually tough, however, there arose the question of whether tumbling, could do the job required and not round-off the sharp edges of serrations, a result which could not be allowed. It was found that tumbling, when properly done, would reduce flash at pushout pins sufficiently, though not remove the flash —and would round the edge at the parting, as desired, but would not round the serration edges. In other words, tumbling met the requirements adequately. In addition, tumbling does not roll any burr into the pivot hole or otherwise significantly affect the hole, which is another important consideration.

Tumbling is done in a two-compartment barrel, the barrel being of steel lined with neoprene. A charge includes 5000 nylon cams. If, however, future production requirements necessitate, about 12,000 moldings could be tumbled in a two-compartment 30 by 30-in. barrel.

It is not necessary to pre-clean the moldings, but the barrel is made clean and dry before it is loaded. The present charge consists of 5000 moldings, 300 lb. of small (No. 5) Alundum chips, and 2 lb. of No. 11 Sturgis compound. Tumbling is done dry and continues for eight hours with the barrel turning at 20 r.p.m.

At the end of this period, the charge is dumped onto a screen to separate the moldings from the chips and compound, after which the molding are hosed off with hot water. Then the moldings are transferred to the open inclined barrel, and are tumbled in Maizo (ground corn cobs) until dry. After dumping on a screen and thus removing the Maizo, the cams are ready for use.

Charge in initial tumbling operation on cams includes elements which help to remove light flash without affecting serrations molded along one edge of cams

PHOTOS COURTESY INTERNATIONAL BUSINESS MACHINES CORP.

After initial tumbling, parts are hosed off and dried in inclined barrel with ground corn cobs

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...and it makes the sales pulse throb

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representatives are working in close cooperation with cosmetic manufacturers to help them capitalize on the many fine qualities of Plaskon. They will assist molders who are interested in increasing sales in the cosmetic field.

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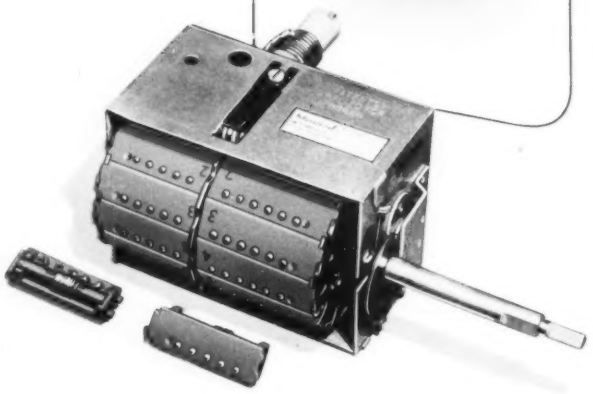
30 Heartbeats Apart

● From Plaskon Alkyd Molding Compound to high precision parts in 30 seconds! That's the remarkable production pace being maintained for these urgently needed parts. The part is a component of "The Standard Tuner" made by Standard Coil Products Company for television sets. In "The Standard Tuner", extreme accuracy is of the utmost importance ...tolerances on the Plaskon Alkyd molded parts are held as low as .0005".

These parts for "The Standard Tuner" are produced in an eight-cavity mold using a total pressure of only 4,000 pounds. Cure time is about 16 seconds. However, in some cases other types of parts made of Plaskon Alkyd are ...in, cured and out in as fast as 8 to 12 seconds.

Plaskon Alkyd is an exclusive new Plaskon plastic—a thermosetting, mineral-filled, molding compound that has many outstanding advantages. It has high arc resistance, heat resistance, chemical and solvent resistance. And it has remarkable dimensional stability.

The many features of Plaskon Alkyd Molding Compound may enable you to effect unusual economies or developments in your products. An experienced Plaskon Service Engineer will be glad to discuss it with you or your molder. Just write and tell us when he should call.



This is "The Standard Tuner" made by Standard Coil Products Company, Chicago, Illinois, and Huntington Park, California. The parts are molded by Wilcox Plastics, Los Angeles; Mayfair Molded Products Company, Chicago, and Trans-Matic Plastics Company, Chicago, from Plaskon Alkyd.

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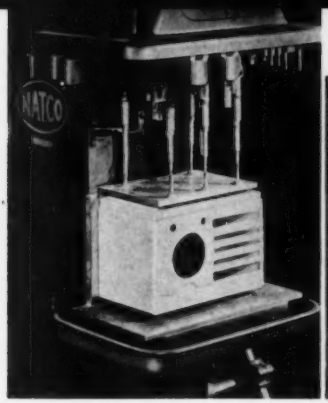
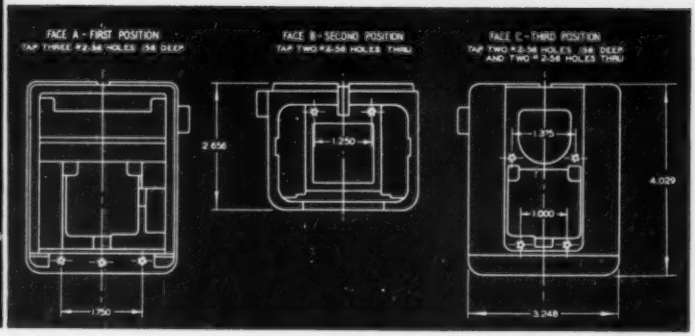


1—Multiple hole drilling on single surface of urea formaldehyde radio case



2—Relative position of camera parts in fixture, with holes on three different sides exposed simultaneously to the tapping spindles. Photo of operation is in Fig. 3

Multi-Hole Drilling Cuts Costs

by H. V. TOWNSLEY*

ONE of the more costly phases of producing plastic parts involves drilling and tapping holes; whether the problem is many holes in one part or one hole in many parts, hole costs can be cut with standard multi-spindle drilling equipment. Further, these lower costs can be achieved while maintaining and in many cases increasing accuracy and quality.

Most tool engineers in the plastics industry have at one time or another given consideration to the construction of special equipment that will completely drill all the holes that are unattainable in the mold. However, when the cost of such equipment is charged against moldings that in many cases will change with next season's styles or engineering improvements, it seldom proves to be a wise investment.

On the other hand, however, it has been demonstrated frequently that standard universal multi-spindle drilling machines, plus the ingenuity present in any successful plant, will drill and tap holes as fast as special machines, and usually at a much lower cost.

Drilling on One Surface

Probably the most common use of the adjustable arm multi-driller is where the holes to be drilled are on one surface of the part, as in Fig. 1. Many different short run jobs can be set up on one machine in this manner with a minimum of time and fixture expenditure.

Often the parts have but few holes in them or are small enough to be drilled two at a time. Time study engineers have shown that to unload and load two parts at the same time takes only slightly longer than it does to unload and load one part. The production savings are obvious and the increased fixture cost is negligible.

It is only one step further to conceive placing a group of parts on the same multi-spindle machine. The number of parts that can be drilled or tapped are only limited by the number of spindles and the horsepower available.

These machines can be converted from drilling to tapping in a matter of a few minutes, and the parts held in the same fixture for both the drilling and tapping operations.

Two or More Surfaces

Molds that have holes coming in from more than one surface are the most expensive to build. Therefore, more jobs of this nature require drilling operations. In the case where the lot size is not too great, the most economical method is to drill or tap the holes in separate set-ups on the same adjustable machine. That is, a given lot can be run to drill the holes in one surface, the set-up changed and the parts run again to drill or tap holes in a second or third surface.

Another method which is practical and economical is to arrange the parts so that all sides requiring holes are exposed to drilling at the same time, as shown in Figs. 2 and 3. Here, the completed part is removed from the extreme right position, the other three parts tumbled to the right, and a new part started at the extreme left position. By this method, one part is completed at each cycle of the machine.

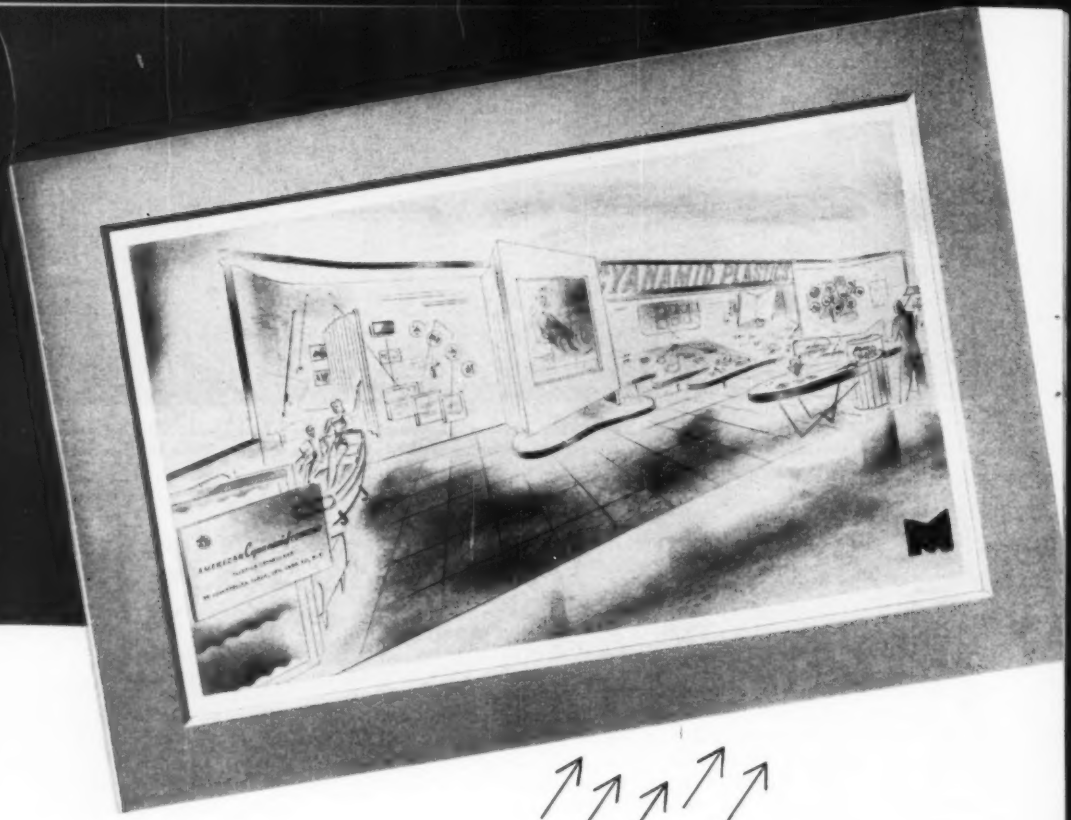
Box Jigs

In many instances the required accuracy between hole centers is so close that it is not advisable to use the multi-hole method just described. When this is the case, box jigs can be used to hold the part, and the jig placed in several locations on the table, as shown in Fig. 4.

It is also possible to convert existing box jigs that were originally designed for single-spindle drilling machines for use on multi-spindle drills, thus saving considerable cost. This is accomplished simply by pro-

(Continued on page 108)

*Supervisor, Small Machines Div., National Automatic Tool Co., Inc., Richmond, Ind.



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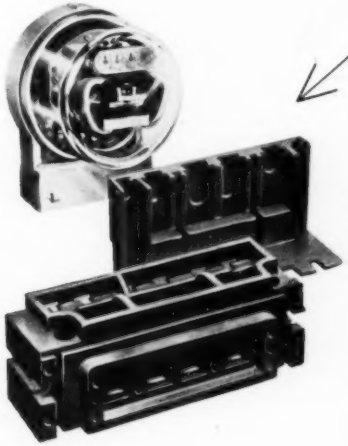

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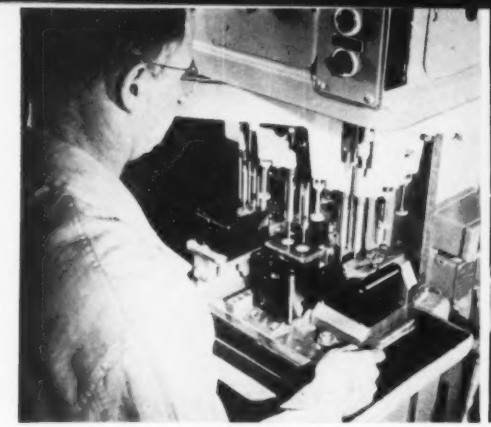
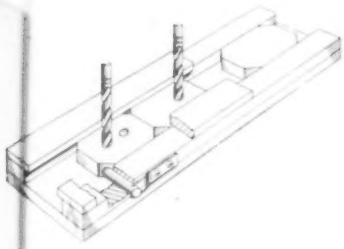
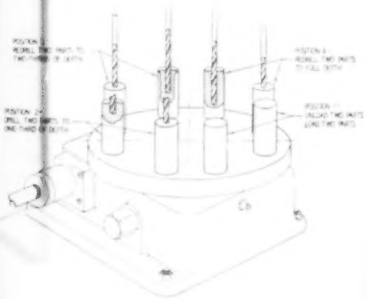


3—Tapping sides of three camera cases. Parts move from left to right, each machine cycle completing one part

4—A plastic camera case part with four faces is held by jig box when close accuracy drilling is required between hole centers



5—High-production drilling with two guide rails in magazine fixture



6—Rotating table has one idle and three deep-hole drilling positions

viding a rail with locating cut-outs on the machine table.

If, however, the required production of close hole center parts is high, a more elaborate fixture or magazine feed jig may be required. One method is to use two guide rails through which the parts are fed, as in Fig. 5. The parts can be located in position by a spring-mounted detent, and then pushed forward by the operator when the drill or tap is retracted from the work.

Rotating Tables

When the parts are of odd shapes which do not lend themselves to magazine feeding, rotating table methods are used to obtain the same economical production results.

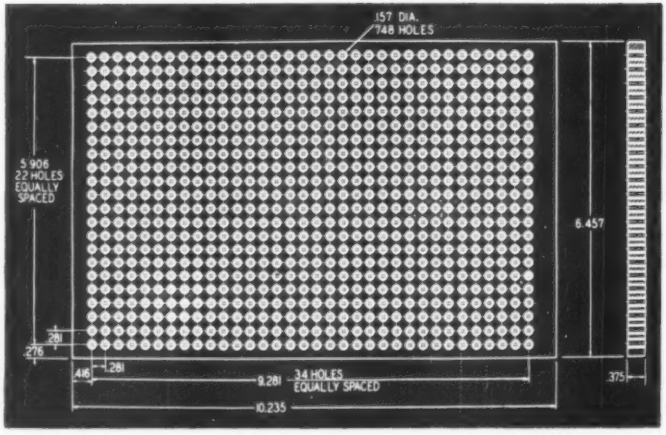
Rotating table, or dial feed, opens up a wide field for low cost hole drilling or tapping. First designed to facilitate combination operations such as drilling, reaming, and counterboring, it was soon discovered that parts could be loaded and unloaded in an idle station in the fixture during the drilling time. This entirely eliminated the element of loading from a time-study viewpoint.

Rotating-table methods can also be used to advantage in deep-hole drilling to separate the steps, reduce the machining time, and facilitate the removal of chips between the steps (see Fig. 6).

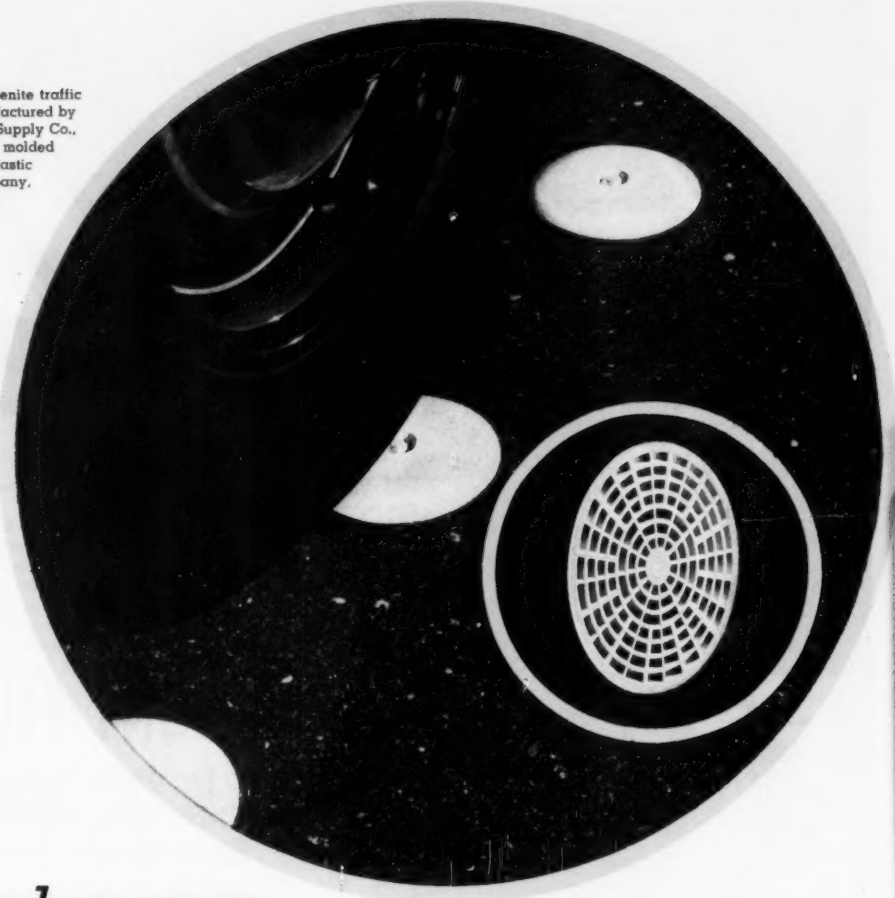
Drilling in Groups

A good many plastic parts require more holes than can be drilled with the spindles or horsepower available on the machine. An example of this is shown in Fig. 7. The solution in this case was to drill a group, or pattern of holes, index the part, drill another group, and repeat the cycle until all holes were drilled.

7—Group-drilling laminated plastic. The part is placed under head of multi-driller, and is automatically indexed until all holes of pattern are drilled



"Dur-O-Line" Tenite traffic markers manufactured by Traffic Safety Supply Co., Portland, Ore.; molded by Beaman Plastic Products Company, Portland, Ore.



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Reinforcement of Polyester Laminates With Fabrics

by MILTON GALLAGHER†, H. H. GOSLEN††, and RAYMOND B. SEYMOUR†††

The physical properties of fabric-reinforced polyester laminates were determined and the relative effects of the reinforcing members were compared. Many fabric reinforcements were laminated with a single resin, while four of these were tested with four other polyester resins. Best over-all results were obtained with glass fibers and regenerated cellulose fibers, with noteworthy isolated properties being shown by laminates of nylon, high tenacity rayon, Steralon (a resin-bonded cellulosic web), cotton sheeting, and linen.

DATA on the effect of various reinforcing members in a polyester laminate are presented in this report. Commercially-available fabrics were impregnated with a thermosetting polyester resin. Test specimens of the resulting laminates were preconditioned for 48 hr. at 50 ± 0.5°C., then allowed to stand at least 16 hr. in a desiccator over calcium chloride, and tested using the procedures of A. S. T. M. and Federal Specification L-P-406a in so far as possible. Some of the fabrics were also surface treated and dried before impregnation in an attempt to improve the laminates' physical properties.

In the first phase of the investigation, the fabrics were impregnated with Thalid 88087B containing 1% benzoyl peroxide. Unless otherwise specified, the laminated impregnated sheets were cured by heating them in a Carver laboratory press for 30 min. at 115° C. and 35 p.s.i. pressure. For a few panels Cure 2 was used, which comprised holding the impregnated panels at 80° C. for 15 min. at 17.5 p.s.i. pressure; then raising the temperature to 115° C. and the pressure to 35 p.s.i. during the next 15 min.; and holding them at these latter conditions for 15 minutes. The 5.5-in. square panels obtained varied in thickness from 0.12 to 0.18 inch. Test results for this part of the work are summarized in Tables I and II.

In the second part of the investigation, laminates were made from four reinforcements—Steralon, cotton sheeting, Fortisan, and Fiberglas fabrics. Each of these was used with four other low pressure polyester resins—Paraplex P-43, Selectron 5003, Vibrin 132, and Plaskon 920-11. All were cured under 15 p.s.i. pressure. Test results obtained with these laminates are summarized in Tables III and IV.

Paraplex P-43, being somewhat viscous for good penetration, was diluted with 5% styrene monomer and catalyzed with 1% benzoyl peroxide. The impregnated panels were introduced into the press at 110° C. and held for 15 min., after which the temperature was raised to 130° C. and maintained for an additional 15 minutes.

Selectron 5003 containing 0.5% benzoyl peroxide was used. The impregnated panels were introduced into the press at 70° C. and held for 15 min., after which the temperature was raised gradually to 125° C. and held for 15 more minutes.

Vibrin 132 containing 1.5% benzoyl peroxide was used. The impregnated panels were introduced into the press at 70° C. and held for 15 min., after which the temperature was raised to 130° C. and held for an additional 15 minutes.

Plaskon 920-11 containing 2% benzoyl peroxide was used. The impregnated panels were introduced into the press at 70° C. and held for 15 min., after which the temperature was raised to 110° C. and held for 45 min. longer.

Description of Fabrics

Cotton.—Cotton duck weighing 16.2 oz./sq. yd. and having 46 and 31 ends per in. in the warp and filling, respectively, was boiled in a 0.15% aqueous sodium aryl alkyl sulfonate solution for 2 hr., rinsed in hot water, boiled for 2 hr. in water, and re-rinsed in hot water. After standing for 24 hr. in 95% ethanol, the washed duck was immersed in 0.5% aqueous calcium hypochlorite solution at a pH of 8.2 to 8.4 for 20 min., rinsed thoroughly, boiled in 1% aqueous acetic acid, and washed, first in water, then in acetone. In order to study the effect of swollen fibers, the washed and bleached duck was immersed in 20% aqueous

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solution of sodium hydroxide for 3 min., rinsed in hot water, boiled in 1% aqueous acetic acid for 1 hr., and finally rinsed in hot and cold water. In order to promote resin penetration and to displace entrapped air, the washed and bleached duck was immersed in styrene monomer under reduced pressure and the resin added to the styrene wet fabric.

Some resistance to flame was secured by immersing the washed and bleached duck in a 20% aqueous solution containing phosphoric acid and urea (1:5 molar ratio), drying at 110°C., and curing at 140°C. for 10 minutes[1]. This same fire-retardant treatment was used to develop flame resistance in other fabrics.

Two cotton sheetings were also used: one weighed 3.8 oz./sq. yd. and had 56 ends per in. in the warp and filling and a thickness of approximately 0.013 inch. The other weighed 2.0 oz./sq. yd. and had 38 ends per in. in the warp and filling and a thickness of approximately 0.012 inch.

Cotton linters.—Chemical cotton manufactured by purifying second cut cotton linters[2] having a fiber length of less than 0.12 in. was used in the form of sheets weighing 4.3 oz./sq. yd. and having a thickness of 0.045 inch.

Steralon.—Commercially-available resin-bonded, randomly oriented, cellulosic fiber web was impregnated from the bottom with care, and the uncured laminate subjected to reduced pressure for several hours in order to remove entrapped air. The four webs used were made up of viscose rayon 50% and cotton 50%, viscose rayon, delustered viscose rayon, and 100% cotton.

Ramie.—The open-woven ramie weighed 4.4 oz./sq. yd., was 0.017 in. thick, and had 23 and 21 ends per in. in the warp and filling, respectively. Ramie was also used as a garnetted web without plastic binder as well as with the binder used in the manufacture of Steralon.

Linen.—The fabric used had a tight weave which was difficult to impregnate without desizing or adding styrene monomer to the cloth or resin. It weighed 6.8 oz./sq. yd., was 0.012 in. thick, and had 64 and 40 ends per in. in the warp and filling, respectively. For some experiments, the linen was desized by immersing it in a 1% Neozyme solution for 30 min. at 60° to 65° C., rinsing with water, and air drying. Cotton linters dispersed in styrene monomer were also added to the resin to promote adhesion between plies. In this case the resin as used contained 12.6% styrene and 0.85% cotton linters.

High tenacity rayon.—Commercial unidirectional rayon tire cord weighing 11.0 oz./sq. yd. was used. It was 0.035 in. thick, with 34 and 2 ends per in. in the warp and filling, respectively.

Fortisan.—A commercial unidirectional fabric 0.28 in. thick and having 29 ends per in. of regenerated cellulose fiber in the warp and 13 ends per in. of cotton yarn in the filling was used. This fabric was treated in many different ways in an attempt to develop greater adhesion between plies. It was desized by immersion in boiling water; 0.5% of non-ionic wetting agent (Span 85) was added to the resin in one instance and 0.7% of colloidal silica (Syton) in another. In most of the panels the plies were symmetrically crossed; i.e., the warp directions of the two center plies were parallel, and each successive ply proceeding outward was placed so that its warp direction was at right angles to its immediate neighbor.

A square-woven Fortisan fabric made from the same fiber as the unidirectional fabric was also used. Its weight was 10.9 oz./sq. yd. with 38 and 34 ends per in. in the warp and filling, respectively; its thickness was approximately 0.021 inch.

Vinyon. — Vinyon filter cloth, weighing 12 oz./sq. yd. and having a thickness of 0.026 in. with 87 and 31 ends per in. in the warp and filling, respectively, was used.

Cellulose acetate.—Cloth woven from dull acetate yarn, weighing 6.35 oz./sq. yd. and having a thickness of 0.013 in. with 46 and 35 ends per in. in the warp and filling, respectively, was used. The warp was 300 denier and the fill 600 denier.

Saran.—Filter cloth weighing 16 oz./sq. yd. and having a thickness of 0.032 in. with 60 and 22 ends per in. in the warp and filling, respectively, was used.

Vinyon N.—A 3/1 Vinyon N twill weighing 5.3 oz./sq. yd. and having a thickness of 0.013 in. with 82 and 68 ends per in. in the warp and filling, respectively, was used.

Nylon.—A taffeta woven cloth, weighing 4.8 oz./sq. yd. and having a thickness of 0.01 in. with 69 and 53 ends per in. in the warp and filling, respectively, was used. The size was removed by immersing for 5 min. in boiling water and rinsing with water. The resin used contained 2% of styrene monomer.

Casein-rayon.—This fabric, which was a 60:40 blend of casein and rayon fibers, weighed 8.8 oz./sq. yd. and had a thickness of 0.028 in. with 58 and 40 ends per in. in the warp and filling, respectively.

Casein-wool.—This fabric, which was a 75:25 blend of casein and wool, weighed 10.8 oz./sq. yd. and had a thickness of 0.040 in. with 60 and 48 ends per in. in the warp and filling.

Asbestos. — Commercial asbestos fabric, weighing 40.0 oz./sq. yd. and having a thickness of 0.092 in. with 19 and 9 ends per in. in the warp and filling, respectively, was used. This cloth was extracted with acetone, and air dried prior to impregnation.

Stainless steel.—Commercial tensile bolt woven from 0.0019-in. thick stainless steel wire was used. It weighed 5.8 oz./sq. yd. and had a thickness of 0.0042 in. with 165 ends per in. in the warp and filling.

Glass fibers.—Commercial 8-harness satin fabric (Fiberglas 181-14), weighing 8.9 oz./sq. yd. and having a thickness of 0.0085 in. with 57 and 54 ends of 225 1/3 yarn per in. in the warp and filling was used.

Fiberglas mat (T-36 M10), which weighed 10.6 oz./sq. yd. and consisted of randomly oriented cut textile fibers bonded with a thermoplastic resin was also used. This mat was wet with styrene monomer prior to impregnation.

Wool Suiting.—This material was typical wool suiting fabric, weighing 7.5 oz./sq. yd. and having 46 and 36 ends per in. in the warp and filling, respectively; its thickness was approximately 0.031 inch. It was impregnated with Thalid 88087B without the use of styrene and cured by the normal cycle.

Viskon.—This material, a nonwoven fabric having decided unidirectional properties, was available as a cotton base fabric as well as a rayon base fabric. Each fabric as received was made into two series of laminates, one with the machine

[1] Seymour, R. B., et al, *American Dyestuff Reporter* 37, 10 (1948).
[2] Gallagher, M., and Seymour, R. B., MODERN PLASTICS *25*, 117 (July 1948).

Table I —Properties of Laminates Made with Thalid 88087B

Reinforcement and treatment	*Direction of test*[a]	*Tensile strength*	*Flexural strength*	*Modulus of elasticity in flexure*	*Edgewise compressive strength*	*Burning rate*[b]	*Resin by weight*	*Specific gravity*	*Rockwell hardness*	*Water absorption*
		p.s.i.	*p.s.i.*	*10^6 p.s.i.*	*p.s.i.*	*in./min.*	*%*			*%*
Cotton duck; 16 oz./sq. yd.										
As received	L	5,900	7,700	3.1	10,200		50.7	1.26	M 28	5.1
	T	6,400	8,600	3.4	10,700		48.4	1.29	M 35	6.7
Washed	L	5,700	8,600	3.4	10,700		48.6	1.26	M 25	6.1
Washed; bleached	L	5,500	9,200	3.7	15,300	0.61	50.4	1.27	M 44	5.9
Washed; bleached; NaOH	L	5,800	8,600	3.3	15,600		53.2	1.34	M 47	5.2
Washed; bleached; styrene on fabric	L	6,500	9,900	3.8	20,900		51.3	1.32	M 66	4.1
Washed; bleached; fire-retardant	L	4,000	7,600	3.3	16,500	[b]	53.7	1.33	M 27	12.5
Cotton sheeting; 3.8 oz./sq. yd.										
As received	L	10,200	19,100	8.3	13,500		52.7	1.20	M 61	3.6
Desized	L	8,400	15,600	5.9	13,000		61.1	1.21	M 54	5.3
Desized; resin content varied:										
62.9%	L	7,700	16,700	8.1	22,800		62.9	1.32	M 96	2.3
60.1%	L	8,600	18,000	8.0	22,700		60.1	1.33	M 96	3.0
54.8%	L	9,200	30,500	8.6	20,600		54.8	1.33	M 95	4.2
Cotton sheeting; 2.0 oz./sq. yd.										
As received	L	8,400	13,700	5.2	13,900		60.0	1.13	M 53	9.1
Desized	L	6,200	9,900	5.9	20,800		69.5	1.25	M 92	2.8
Cotton linters										
As received	L	4,800	7,200	5.3	10,700	0.45	60.7	1.22	M 41	4.8
	T	5,200	8,300	6.2	9,900		59.6	1.19	M 41	6.7
Fire retardant	L	3,900	6,900	3.2	9,300	[b]	69.7	1.31	M 35	7.9
Steralon										
50% viscose rayon; 50% cotton	L	8,300	10,800	7.0	20,500	0.90	69.6	1.29	M107	2.8
	T	8,100	10,500	6.9	19,100		69.0	1.29	M107	2.8
Viscose rayon	L	6,400	10,200	9.7	22,700	0.38	66.8	1.28	M116	2.2
Viscose rayon; delustered	R	5,900	8,400	7.4	20,400		73.1	1.26	M106	2.8
Ramie										
Fabric	L	9,100	16,200	8.1	14,700	0.76	54.5	1.27	M 95	4.0
Mat; unbonded; styrene	R	7,300	14,900	6.9	13,900	1.15	68.1	1.26	M100	3.3
Mat; bonded	R	7,900	10,800	6.9	21,300		68.9	1.29	M105	1.9
Linen										
Styrene in resin	L	11,400	17,900	14.9	6,600	0.62	30.6	1.33	M 80	7.0
Styrene in fabric	L	15,200	19,400	9.6	8,100		32.6	1.37	M 88	5.7
Desized; no styrene	L	5,300	10,400	5.2	7,500		48.6	1.29	M 54	4.8
Untreated; cellulose tissue between plies	L	8,600	14,500	6.7	7,600		49.6	1.21	M 55	4.1
Untreated; cotton linters and styrene in resin	L	10,600	14,900	7.7	7,500		46.7	1.29	M 69	3.5
Fire-retardant on fabric; styrene in resin	L	6,500	11,500	5.5	12,800	0.34	41.4	1.36	M 73	9.6
High tenacity rayon (tire cord)	L	21,700	15,400	7.2	7,700	0.59	36.0	1.27	M 55	9.7
	T	600	2,000	[c]	6,200		36.8	1.24	M 53	14.8
	C	10,000	13,100	4.8	6,800		40.3	1.21	M 51	7.4
Fortisan; unidirectional										
As received;	L	44,800	37,700	30.5	13,200	0.52	24.7	1.37	M 97	11.7
Styrene on fabric	T	900	3,600	2.1	13,000		22.1	1.35		10.9
Desized	C	24,300	22,800	12.8	10,400		26.7	1.32	M 82	7.9
Styrene on fabric; span 85 in resin	C	16,500	18,800	14.9	6,400		26.7	1.32	M 48	11.4
Styrene; 0.7% SiO_2	C	17,000	28,800	16.3	13,800		32.3	1.36	M 88	4.3
No styrene; 0.7% SiO_2	C	19,100	25,200	17.3	12,100		29.3	1.34	M 79	5.8
No styrene; 1.5% SiO_2	C	18,500	21,200	16.0	8,900		29.2	1.34	M 57	9.2

(Continued on next page)

Table 1—Properties of Laminates Made with Thalid 88087B (Continued)

Reinforcement and treatment	Direction of test[a]	Tensile strength	Flexural strength	Modulus of elasticity in flexure	Edgewise compressive strength	Burning rate[b]	Resin by weight	Specific gravity	Rockwell hardness	Water absorption
		p.s.i.	p.s.i.	10^6 p.s.i.	p.s.i.	in./min.	%			%
Fire retardant; styrene on fabric	C	17,600	20,500	13.5	11,000	0.24	37.1	1.36	M 86	9.9
Desized; styrene on fabric	C	20,400	18,200	15.8	8,500		29.8	1.33	M 53	12.0
Styrene on fabric; Span 85 in resin	C	24,700	17,700	16.9	8,300		26.9	1.33	M 59	9.1
No styrene; 0.7% SiO_2	C	19,100	25,200	17.3	12,100		29.3	1.34	M 79	5.8
No styrene; dry	C	24,600	22,600	18.5	9,400		28.8	1.35	M 86	5.2
70% R. H.	C	22,600	21,800	17.0	8,300		27.7	1.34	M 75	7.7
90% R. H.	C	22,500	16,900	16.2	6,900		26.0	1.33	M 62	12.3
Fortisan; square woven										
As received; normal cure	L	17,700	17,800	5.4	6,700		30.8	1.28	M 66	7.9
As received; cure 2	L	20,900	22,800	6.8	8,200		33.6	1.35	M 81	7.2
Desized; 5% Stymer; normal cure	L	8,900	17,300	3.4	9,000		44.9	1.10	M 21	13.0
Desized; 5% Stymer; cure 2	L	16,700	21,600	6.9	11,200		45.0	1.21	M 52	9.1
Vinyon	L	2,800	6,800	3.4	12,900	0.62	54.4	1.31	M 87	0.4
Cellulose acetate	L	3,800	6,500	5.4	21,100	1.00	40.3	1.28	M106	1.7
Saran	L	6,400	7,500	[c]	4,700	[b]	20.6	1.47	M 41	2.4
Vinyon N	L	6,600	11,500	2.2	14,000	0.40	51.4	1.21	M 66	0.9
Nylon; desized; styrene in resin	L	21,700	13,000	1.7	12,700	0.57	31.1	1.12	M 99	1.8
Casein-rayon; 60-40 blend	L	3,700	5,000	4.8	22,800	0.52	43.2	1.26	M114	2.2
Casein-wool; 75-25 blend	L	2,200	3,600	4.2	18,100	[b]	38.7	1.14	M 83	6.4
Asbestos	L	3,100	9,300	5.9	12,000	0.47	50.4	1.40	M 61	3.6
Stainless steel fabric	L	14,800	30,000	11.7	22,800		33.5	3.18	M 65	0.7
Fiberglas										
Fabric	L	34,400	28,000	7.3	17,900	[b]	32.4	1.97	M105	1.5
	T	38,700	33,000	8.5	19,400	[b]	32.4	1.97	M105	1.5
Mat; styrene on mat	R	15,100	27,400	8.2	30,700	0.93	52.9	1.48	M115	0.5
Wool suiting	L	5,300	12,500	3.8	12,600		47.4	1.24	M 91	5.2
Viskon										
Cotton; parallel	L	10,600	14,900	8.1	20,100		71.7	1.21	M 74	4.9
Cotton; crossed	L	6,700	13,200	6.7	16,400		72.7	1.17	M 48	6.0
Rayon; parallel	L	7,700	16,000	8.3	17,900		63.6	1.17	M 45	5.8
Rayon; crossed	L	5,600	10,400	6.4	17,300		66.6	1.18	M 73	6.7
Resin; unfilled; cast	R	3,900	15,700	4.8	25,800		100.0	1.25	M 86	0.8

[a] Code for direction of test: L = longitudinal; T = transverse; R = random; C = crossed plies.
[b] Self-extinguishing.
[c] Too flexible to measure.

directions of every ply parallel and one in which the machine directions of the plies were at 90° to each other. The cotton Viskon weighed 2.0 oz./sq. yd. and was approximately 0.012 in. thick. The rayon Viskon weighed 2.2 oz./sq. yd. and was approximately 0.009 in. thick.

Unfilled resin.—These panels were prepared by pouring the catalyzed Thalid into cells made from plate glass and spacers. The edges of the cells were sealed with paper pretreated with plasticized polyvinyl alcohol. The filled cells were allowed to remain at room temperature for 24 hr., after which the cure was completed by holding the cells for 100 hr. at 40° C.

Discussion of Results

An exhaustive analysis of the results obtained is beyond the scope of the present paper. The detailed information is presented in the accompanying tables. The properties of the most promising laminates are summarized in the following analysis of reinforcements:

1. Reinforcements which produced laminates having tensile strengths above 30,000 p.s.i.

Fiberglas fabric	
Paraplex P-43	49,000
Selectron 5003	49,000
Fortisan unidirectional fabric—Thalid 88087B; parallel, tested longitudinally	44,800
Fiberglas fabric	
Vibrin 132	42,600
Plaskon 920-11	41,000
Thalid 88087B	38,700
Fortisan undirectional fabric; crossed	
Vibrin 132	31,100
Plaskon 920-11	30,900

2. Reinforcements which produced laminates having edgewise compres-

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sive strengths exceeding 30,000 p.s.i.

Fiberglas fabric	
Selectron 5003	43,100
Vibrin 132	41,700
Paraplex P-43	40,600
Steralon (50% cotton, 50% rayon)	
Vibrin 132	38,400
Plaskon 920-11	35,500
Fiberglas fabric	
Plaskon 920-11	34,800
Cotton sheeting; 3.8 oz./sq. yd.	
Vibrin 132	31,900
Plaskon 920-11	31,700
Fiberglas mat—Thalid 88087B; styrene on mat	30,700

3. Reinforcements which produced laminates having flexural strengths above 30,000 p.s.i.

Fiberglas fabric	
Selectron 5003	57,400
Paraplex P-43	51,000
Vibrin 132	48,800
Plaskon 920-11	39,800
Fortisan undirectional fabric—Thalid 88087B, Parallel; tested longitudinally	37,700
Fortisan unidirectional fabric; crossed	
Plaskon 920-11	33,600
Selectron 5003	33,200
Fiberglas—Thalid 88087B	
Fabric; transverse	33,000
Mat; styrene on mat	30,000

4. Reinforcements which produced laminates having a value for modulus of elasticity in flexure above 15 x 10^5 p.s.i.

Fortisan unidirectional fabric—Thalid 88087B Parallel; tested longitudinally 30.5 x 10^5	
Crossed; desized; oven dry	18.5
Crossed; desized; styrene on fabric; span 85 in resin	16.9
Crossed; treated with colloidal silica	17.3
Fiberglas fabric	
Selectron 5003	27.6
Plaskon 920-11	27.5
Vibrin 132	25.9
Paraplex P-43	24.9
Fortisan unidirectional fabric; crossed	
Plaskon 920-11	17.6
Vibrin 132	16.4
Selectron 5003	16.4

5. Reinforcements which produced laminates having water absorption values of less than 1.0%.

Fiberglas fabric	
Paraplex P-43	0.2
Selectron 5003	0.3
Vinyon—Thalid 88087B	0.4
Fiberglas mat—Thalid 88087B; styrene on mat	0.5

Table II.—Impact Properties of Laminates Made with Thalid 88087B (Unless Otherwise Noted)

Reinforcement and treatment	*Impact resistance*	*Impact flexural strength*
	p.s.i.	*p.s.i.*
Cotton duck; 16 oz./sq. yd.		
washed and bleached	1,000	19,700
Cotton sheeting; 3.8 oz./sq. yd.		
As received	1,790	38,500
Desized	1,950	33,900
Desized; resin content varied:		
62.9%	1,340	33,000
60.1%	1,860	38,000
54.8%	1,790	39,100
Cotton sheeting; 2.0 oz./sq. yd.		
As received	1,340	26,200
Cotton linters; as received	418	15,200
Steralon		
50% viscose rayon, 50% cotton	610	20,300
Delustered viscose rayon	270	17,600
Viskon		
Cotton; parallel	574	22,600
Cotton; crossed	433	16,900
Rayon; parallel	731	25,600
Rayon; crossed	490	17,700
Ramie		
Fabric	752	24,700
Mat; unbonded; styrene	187	11,100
Mat; bonded	480	18,200
Linen		
Desized	1,200	25,000
As received		
styrene in resin	1,250	43,200
Styrene on fabric	1,500	38,100
Cotton linter, styrene in resin	960	27,300
Cellulose tissue	686	21,400
Fire retardant;		
styrene in resin	807	20,500
High tenacity rayon (tire cord)		
Longitudinal	1,160	28,800
Transverse	67	
Crossed	1,140	23,400
Fortisan; unidirectional; crossed		
Desized		
Styrene on fabric	700	33,200
No styrene		
Dry	1,350	50,200
70% R. H.	1,100	43,300
90% R. H.	1,000	40,000
Colloidal SiO_2 (0.7%)	978	41,000
Styrene on fabric, span 85 in resin	870	38,100
As received		
Styrene on fabric	654	30,900
0.7% SiO_2, dried, styrene on fabric	2,200	59,800
1.5% SiO_2; dried, styrene on fabric	526	28,900
Fire retardant, dried, styrene on fabric	1,080	38,000
As received		
Selectron 5003	1,200	46,200
Vibrin 132	1,340	47,800
Fortisan; square woven		
As received; normal cure	1,170	24,700
As received; cure 2	1,570	32,700
Desized		
5% Stymer; normal cure	1,460	22,300

(*Continued on page* 118)

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Table II.—Impact Properties of Laminates Made with Thalid 88087B Unless Otherwise Noted (Continued)

Reinforcement and treatment	*Impact resistance*	*Impact flexural strength*
	p.s.i.	*p.s.i.*
5% Stymer; cure 2	1,910	35,800
Vinyon	670	15,100
Cellulose acetate	570	17,100
Saran	950	.....
Vinyon N	1,620	19,100
Nylon	1,540	16,000
Casein-rayon	60	5,280
Casein-wool	140	7,700
Asbestos	550	18,200
Stainless steel fabric	1,540	42,400
Fiberglas fabric		
Longitudinal	3,260	48,900
Transverse	2,960	49,100
Fiberglas mat; styrene on mat	2,180	42,000
Wool suiting	1,200	21,300
Pure resin (cast)	405	13,900

Steralon (50% cotton, 50% rayon)—Selectron 5003 0.6
Stainless steel fabric—Thalid 88087B 0.7
Steralon (50% cotton, 50% rayon)—Paraplex P-43 0.8
Steralon (100% cotton)—Paraplex P-43 0.8
Fiberglas fabric—Vibrin 132 0.8
Vinyon N—Thalid 88087B 0.9
Steralon (50% cotton, 50% rayon)—Vibrin 132 0.9
Fiberglas fabric—Plaskon 920-11 0.9

6. Reinforcements which produced laminates having a Rockwell hardness above M110.

Fiberglas fabric
Vibrin 132 M119
Plaskon 920-11 M118
Steralon (100% viscose rayon)—Thalid 88087B M116
Fiberglas mat—Thalid 88087B; styrene on mat M115
Casein-rayon—Thalid M114
Fiberglas fabric—Selectron 5003 M113
Steralon (50% cotton, 50% rayon)—Vibrin 132 M113
Fiberglas fabric—Paraplex P-43 M112
Steralon (50% cotton, 50% rayon)—Selectron 5003 M111

7. Reinforcements which produced laminates with burning rates less than 0.5 in./min. All the laminates listed were made with Thalid 88087B.

Cotton duck; with fire retardant Self-extinguishing
Chemical cotton
Untreated 0.43
With fire retardant Self-extinguishing
Casein-wool; untreated Self-extinguishing
Fiberglas fabric Self-extinguishing
Saran Self-extinguishing
Fortisan; with fire retardant 0.24
Linen; with fire retardant 0.34
Steralon (viscose rayon) 0.38
Vinyon N 0.40
Asbestos 0.47

8. Reinforcements which produced laminates with impact resistance above 3000 p.s.i.

Fiberglas fabric
Selectron 5003 4,960
Paraplex P-43 4,920

Table III.—Properties of Laminates Made with Various Polyesters

Reinforcement	*Resin*	*Tensile strength*	*Flexural strength*	*Modulus of elasticity in flexure*	*Edgewise compressive strength*	*Resin by weight*	*Specific gravity*	*Rockwell hardness*	*Water absorption*
		p.s.i.	*p.s.i.*	*10^6 p.s.i.*	*p.s.i.*	*%*			*%*
Steralon A (100% cotton)	Paraplex P-43	7,600	9,300	7.35	21,500	78.6	1.24	M 97	0.78
Steralon B (50% cotton, 50% viscose rayon)	Paraplex P-43	8,400	13,900	8.09	23,400	76.5	1.26	M109	0.75
	Selectron 5003	8,300	8,300	7.14	23,800	80.7	1.27	M111	0.60
	Vibrin 132	5,500	8,500	7.11	38,400	81.0	1.36	M113	0.90
	Plaskon 920-11	6,500	8,700	5.25	35,500	82.2	1.37	M108	1.06
	Thalid 88087B	8,300	10,800	6.98	20,500	69.0	1.29	M107	2.80
Cotton sheeting; 3.8 oz./sq. yd.	Paraplex P-43	10,300	14,200	8.43	17,900	49.0	1.22	M 70	2.33
	Selectron 5003	11,400	16,200	8.26	23,000	52.2	1.34	M 96	1.69
	Vibrin 132	10,700	14,000	7.69	31,900	53.0	1.39	M 93	2.77
	Plaskon 920-11	12,200	19,100	7.61	31,700	53.9	1.40	M 92	3.15
	Thalid 88087-B	10,200	19,100	8.30	13,500	52.7	1.20	M 61	3.60
Fortisan	Unidirectional								
	Paraplex P-43	23,700	15,500	12.4	12,000	31.0	1.27	M 68	8.93
	Selectron 5003	29,200	33,200	16.4	16,200	31.4	1.36	M 97	3.40
Fabric; crossed	Vibrin 132	31,100	27,600	16.4	15,600	38.1	1.40	M 87	4.50
	Plaskon 920-11	30,900	33,600	17.6	15,600	37.8	1.38	M100	4.31
Fiberglas fabric	Paraplex P-43	49,000	51,000	24.9	40,600	32.5	1.84	M112	0.22
	Selectron 5003	49,000	57,400	27.6	43,100	34.2	1.84	M113	0.25
	Vibrin 132	42,600	48,800	25.9	41,700	32.9	1.92	M119	0.77
	Plaskon 920-11	41,000	39,800	27.5	34,800	33.6	1.93	M118	0.94
	Thalid 88087-B	38,700	33,000	8.46	19,400	32.4	1.97	M105	1.50

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Vibrin 132	4,200
Plaskon 920-11	3,910
Thalid 88087B; longitudinal	3,260

Fire-Retardant Treatment

The fire-retardant treatment given the cotton duck, cotton linters, Fortisan, and linen was effective in reducing the flammability of the laminates, rendering them either self-extinguishing or reducing their burning rates by about 50%. However, the tensile and flexural properties were reduced by this treatment, in some instances by as much as 40%. The edgewise compressive strength, however, was improved, and with the linen laminates it was raised by 95%. Stiffness in general was lowered by the treatment. The water absorption was also adversely affected, being increased in the cotton duck laminates by over 100%.

Although it was not the intent of the investigation to study various pretreatments of the reinforcing fabrics, indications are that improvements in properties are obtainable by this means. The results in Table I show that pretreating the cotton duck with styrene monomer increased the edgewise compressive strength of the laminates by 100%, with an associated increase in flexural strength and stiffness of 28%. The styrene treatment of the linen fabric resulted in an increase in tensile strength of 33% and in edgewise compressive strength of 24%. The addition of small amounts of colloidal silica to the Fortisan fabric prior to lamination increased the edgewise compressive strength by 16% and the flexural strength by 11%. No doubt these increases in strength resulted from increased adhesion between resin and fibers.

Impact Resistance

A simple method of test for impact strength was devised which was entirely satisfactory for the purpose. The procedure comprised dropping steel balls on a specimen held horizontally as a cantilever in a vise. The range of ball size needed was determined with the first specimen of a series of six representing the sample by dropping balls of increasing diameter until failure of the specimen occurred. With the remainder of the specimens, only 2 or 3 blows per specimen were required to determine the energy absorbed by the specimen at failure.

The specimens were machined to a width of 0.372 ± .002 in.; thickness varied between 0.100 and 0.180 inch. The test length of the specimen was adjusted to maintain a fixed ratio of test length to thickness. The value of this fixed ratio was 10. This test length did not include the unloaded distance from the unsupported end of the specimen to the point of impact. This unloaded distance was held constant at 0.25 inch.

The point of failure in most cases was obvious, and was characterized as the minimum energy which caused rupture. Under these conditions, the broken end of the specimen was not thrown; hence, no appreciable amount of energy was imparted to this broken end. In cases where rupture was not obvious, the energy to cause failure was arbitrarily determined as the energy imparted by the steel ball when it rebounded at an angle of approximately 10° to the horizontal. At this point the specimens showed clear signs of permanent deformation after the blow, usually with some indications of plie delamination.

The steel balls used in the test were Grade #1, ball-bearing quality, having a tolerance in sphericity and size of ± 0.000025 inch. The series of balls ranged in size from 5/16 to 1¼ in. in increments of 1/32 inch. Their weights, accurately determined on an analytic balance, varied from 0.0716 to 4.598 oz. (2.0310 to 130.350 grams). The height of fall, held at 60.5 in. (153.6 cm.), resulted in a terminal velocity at impact of 18.00 ft./sec. (549 cm./sec.).

Prior to dropping, the balls were held by vacuum against the flared end of a copper tube, 0.25 in. in diameter by 10 in. long. The end of the copper tube was flared, and the inner bearing surface turned on a lathe to an angle of about 30°. The vacuum was supplied by a small laboratory air pump. Release was accomplished merely by turning off the pump motor, and when the vacuum was sufficiently dissipated, the balls dropped.

With this simple mechanism, the point of impact on the specimen was surprisingly reproducible. Patterns of the impact, recorded on the specimen by means of carbon paper, over the entire range of ball sizes, were superimposed upon each other with a variance of only ± 0.04 in. (1 mm.). Since the smallest test length employed was 1 in., the maximum error in hitting a given point was ± 4%.

The results obtained by this test method are summarized in Tables II and IV in terms of "impact resistance" and "impact flexural

(Continued on page 172)

Table IV.—Impact Properties of Laminates Made With the Various Polyesters

Reinforcement	*Resin*	*Impact resistance*	*Impact flexural strength*
		p.s.i.	*p.s.i.*
Steralon A (100% cotton)	Paraplex P-43	340	15,900
Steralon B (50% cotton, 50% viscose rayon)	Paraplex P-43	250	14,200
	Selectron 5003	280	14,200
	Vibrin 132	220	12,400
	Plaskon 920-11	220	10,800
	Thalid 88087-B	610	20,600
Cotton sheeting; 3.8 oz./sq. yd.	Paraplex P-43	780	25,600
	Selectron 5003	1070	29,700
	Vibrin 132	1730	36,500
	Plaskon 920-11	1520	34,000
	Thalid 88087-B	1790	38,500
Fortisan Unidirectional Fabric; crossed	Paraplex P-43	920	33,800
	Selectron 5003	1700	52,800
	Vibrin 132	1960	56,600
	Plaskon 920-11	2300	63,600
Fiberglas fabric	Paraplex P-43	4920	110,800
	Selectron 5003	4960	117,300
	Vibrin 132	4200	104,300
	Plaskon 920-11	3910	103,700
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PLASTICS DIGEST*

Abstracts from the world's literature of interest to those who make or use plastics or plastics products. Send requests for periodicals to the publishers listed.

General

EDUCATION IN THE PLASTICS INDUSTRY. Brit. Plastics *21*, 450-3 (Aug. 1949). Details of courses for the qualification of members of the Plastics Institute (Great Britain) are discussed.

Molding and Fabricating

MODERN ELECTROPLATING OF PLASTICS. Plastics (London) *14*, 67-8 (Oct. 1949). The electroplating of plastics with metals is described briefly.

EXTRUSION OF UNPLASTICIZED POLYVINYL CHLORIDE. A. Burness, J. R. Cann, and P. Ions. Brit. Plastics *21*, 472-80, 565-74 (Sept., Oct. 1949). The technique and machines for extruding unplasticized polyvinyl chloride resin are described. Three types of extruders are used, namely, hydraulic ram, single-screw and multiple-screw machines. The extrusion techniques described are concerned principally with the single-screw machines. The principal problem is the thermal decomposition of the polymer. Low molecular weight polymers containing a heat stabilizer and a lubricant are used. A typical compound consists of 100 parts of polymer, 0.5 parts diphenyl thiourea, and 2 parts calcium stearate. Fillers and dyes may also be added. The materials are mixed on a roll, creped, chipped, and dried at 105°C. before extruding. Even a small amount of water will form bubbles in the product. Details of the operation techniques and machines are given.

THE R.A.E. NO-PRESSURE PROCESS FOR MOLDING "DURESTOS". L. N. Phillips. Brit. Plastics *21*, 535-41 (Oct. 1949). Forming and molding techniques of asbestos-phenolic resin sheet are described. The resin is a water-soluble phenol-formaldehyde before cure. Parts can be made with "no-pressure". Properties are also reported.

Applications

SYNTHETIC RESINS IN THE TANNERY. Brit. Plastics *21*, 641-5 (Dec. 1949). The use of resins in tanning and in the finishing of leather is described.

PLASTICS AND THE PRINTING INDUSTRY. Plastics (London) *14*, 119-21 (Dec. 1949). Metal printing blocks are made by using an intermediary of polyvinyl chloride plastic which is sprayed with silver and then plated. Other printing processes using plastics are also described briefly.

OXYGEN REMOVAL FROM WATER BY AMMINE EXCHANGE RESINS. G. F. Mills and B. N. Dickinson. Ind. Eng. Chem. *41*, 2842-4 (Dec. 1949). Dissolved oxygen in water may be removed effectively to a level of less than 0.1 p.p.m. by treatment with an anion exchange resin on which reduced copper or silver has been deposited. The metal-resin complex may be regenerated after use by treatment with suitable reducing agents. The method provides a means of deoxygenating water by chemical means without contamination of the resulting water by added chemicals. The economics of this method are discussed.

PLASTICS AID IN MEDICAL TEACHING. Brit. Plastics *21*, 634-40 (Dec. 1949). The use of plastics in the construction of anatomical and skeletal models for use in medical teaching instruction is described.

Coatings

FIRE-RETARDANT COATINGS FOR FABRIC-COVERED AIRCRAFT. S. G. Weissberg, G. M. Kline, and H. L. Hansberry. Ind. Eng. Chem. *41*, 1742-9 (Aug. 1949). Simulated power-plant fire tests of doped fabrics coated with fire-retardant coatings, conducted under wind-tunnel conditions, demonstrate that it is possible to increase the critical time interval between the instant of first contact of fire with fabric and the instant of fabric destruction, from the present value of 2 sec. with cellulose nitrate dope or 6 sec. with cellulose acetate butyrate dope to 12 sec. with a fire-retardant coating applied over cellulose acetate butyrate dope. A laboratory method for the quick evaluation of relative performance of fire-retardant coatings is described; this test will facilitate the further development of fire-retardant coatings. The protective action of fire-retardant coatings on cellulose nitrate dope is too small to be of any value. The results of outdoor exposure tests reveal several fire-retardant coating systems with good weathering characteristics which are recommended for further development. The use of a mixture of boric acid and borax as fabric impregnant, while effective as a fire retardant, has a deleterious effect on adhesion of dope to fabric which is apparent on outdoor exposure.

Chemistry

NEW METHOD FOR FORMING VINYL POLYMERS IN WOOL. Nature *164*, 576 (Oct. 1949). Methacrylic acid is polymerized in wool using an aqueous medium and thiolacetic acid and sodium bisulfite as catalysts.

Materials

SHOCK-RESISTANT PHENOLICS. P. Robitschek. Brit. Plastics *21*, 438-47, 481-85 (Aug., Sept. 1949). The properties of the fillers and resins, the compositions, processing, molding technique, and properties of phenolic plastics with high impact strength are described in detail. 49 references.

HONEYCOMB SANDWICH CONSTRUCTION. G. May. Plastics (London) *14*, 64-6 (Oct. 1949). Various types of honeycomb sandwich construction are described.

CELLULAR EBONITES FROM NITRILE-TYPE SYNTHETIC RUBBERS. R. A. Clark and L. E. Cheyney. Ind. Eng. Chem. *41*, 2252-8 (Oct. 1949). Compounding studies are presented, showing the effect of several vari-

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ables on the compression properties of cellular ebonites cured at 325° F., including choice of nitrile-type rubber, amounts of sulfur, diazoaminobenzene (blowing agent), and several selected plasticizers, pigments, and accelerators.

PROPERTIES OF LACQUER-TYPE CELLULOSE ACETATE BUTYRATES. C. J. Malm and H. L. Smith, Jr. Ind. Eng. Chem. *41*, 2325-35 (Oct. 1949). The properties of several low viscosity cellulose acetate butyrate esters are described with particular reference to their application in the field of protective coatings. The properties discussed include solubilities in single solvents, binary solvent mixtures, and more complex lacquer-type solvent mixtures; viscosity measurements in the above types of solvents; dilution ratios in both single solvents and solvent mixtures; and compatibilities with plasticizers and synthetic resins. The variations and trends in properties among the various cellulose acetate butyrates are emphasized and the particular usefulness of each type pointed out. Some of the esters compare favorably with cellulose nitrate for use as the film-forming agent in lacquers and protective coatings, are less flammable, and have good color retention and stability on aging. The cellulose acetate butyrates described offer definite possibilities in the formulation of lacquer-type protective coatings.

COMPOSITION OF TWO TYPES OF CELLULOSE PHOSPHATES. J. D. Reid, L. W. Mazzeno, Jr., and E. M. Buras, Jr. Ind. Eng. Chem. *41*, 2831-4 (Dec. 1949). Cellulose phosphates were prepared by the commercial urea-phosphate method of preparing flameproofed cloth and by the pyridine - phosphorus oxychloride method. By electrometric titration it is shown that the combined phosphorus in cellulose phosphate prepared by the treatment of cellulose with urea phosphate is probably entirely in the form of a monosubstituted phosphate ester. There is no evidence of the formation of other, more highly substituted products. The structure of cellulose phosphate prepared by the treatment of cellulose with phosphorus oxychloride-pyridine mixture is similar, except that, in a typical sample, approximately 23% of the phosphorus can be accounted for as a disubstituted phosphate ester.

POLYETHYLENE: USES AND PROSPECTS. C. A. Southwick, Jr. Modern Packaging *22*, 117-21, 166, 168 (Aug. 1949). The properties and applications of polyethylene from the viewpoint of packaging are discussed.

Properties

CREEP AND DAMPING PROPERTIES OF POLYSTYRENE. J. A. Sauer, J. Marin, and C. C. Hsiao. J. Applied Phys. *4*, 507-17 (June 1949). The anelastic behavior of polystyrene was studied by means of creep tests under long-time load application and by means of damping capacity tests under rapidly varying repeated loading. Tensile creep data taken at various stress amplitudes reveal that the log of the creep rate (at 1000 hours) varies linearly with the log of the stress amplitude. A similar type of variation is obtained when damping capacity or energy absorbed per cycle is plotted against stress amplitude. From these two sets of data, the creep rate is found to be proportional to the square of the damping capacity. It would thus appear possible, for polystyrene at least, to predict 1000-hour creep rates from short-time measurements of absorbed energy under dynamic loading conditions. The data obtained from the creep and damping tests, together with additional data from short-time tension and compression tests, seem to be consistent with an internal structure in which the linear polymer chains and groups of chains are in ordered or partially extended positions, but in which, in the absence of stress, no preference is shown for any particular direction. Under the action of stress, particularly if the stress is maintained for a long period of time, a tendency exists for the ordered regions to orient in the direction of the applied stress. The so-called "crazing" condition which may occur in the creep specimens is probably a manifestation of this orientation. X-ray evidence appears to support this point of view.

RHEOLOGICAL PROPERTIES OF POLYSTYRENE BELOW 80°C. B. Maxwell and L. F. Rahm. Ind. Eng. Chem. *41*, 1988-93 (Sept. 1949). The rheological properties of polystyrene below 80°C. were studied by means of stress relaxation tests at various elongations and temperatures and by creep tests at various loads and temperatures. The results indicate that there are two mechanisms of stress relaxation and creep in this material. The first is the slipping of chain segments and the second is crazing. The relation of crazing to time, temperature, stress, and strain is reported. It is concluded that a specific critical elongation must be reached before crazing takes place. This elongation is independent of temperature but is affected by certain organic solvents.

Testing

IMPROVED SINGLE-UNIT SCHIEFER ABRASION TESTING MACHINE. H. F. Schiefer, L. E. Crean, and J. F. Krasny. A.S.T.M. Bull. No. 159, 73-8 (July 1949). An improved single-unit Schiefer abrasion testing machine is described. It can be adapted for testing a great variety of materials under a wide range of test conditions. Different types of specimen holders and abradants can be used with the machine. Both the pressure and tension on the specimen can be fixed at selected values and maintained constant throughout the test period. A variety of materials including woven, knitted, pile, and coated fabrics, felt, plastics, paper, leather, and other materials were abraded with the machine. The abrasive wear of each material was found to be extremely uniform over the abraded area. The effect of wet cleaning solutions on printed-enamel felt-base floor coverings was evaluated. The effect of the amount of plasticizer on the resistance to abrasion of plastics was readily measured. The rate of abrasion is directly proportional to the amount of plasticizer present. The abrasive wear in tests of woven fabrics appeared very similar to that which occurred in service. A quantitative method based upon the change in electrical capacitance of the specimen with abrasion is described for evaluating the amount of abrasion. A quantity which is a measure of abrasive destruction or ruin is defined. This quantity was used to obtain an iso-ruin map of a large area of a trouser leg.

(*Continued on page* 127)

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Color	50 Hazen, Maximum
Form	Clear liquid
Odor	Mild, characteristic
Acidity (as Phthalic Acid), %	0.01 Maximum
Specific Gravity, 20/20°C.	0.983 to 0.987
Saponification Number	280-290
Cloud test	Clear at 0°C.
Containers	50-55 gal. non-returnable steel barrels.

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Color	80 Hazen, Maximum
Form	Clear liquid
Odor	Mild, characteristic
Distillation at 5 mm. Hg, °C.	189-222
Specific Gravity, 20/20°C.	1.075 to 1.081
Acidity (as Phthalic Acid), %	0.01 Maximum
Saponification Number	364-374
Containers	50-55 gal. non-returnable steel barrels.

BARRETT "ELASTEX" 28-P PLASTICIZER
(Dioctyl Phthalate)

Color	50 Hazen, Maximum
Form	Clear liquid
Odor	Mild, characteristic
Acidity (as Phthalic Acid), %	0.01 Maximum
Specific Gravity, 20/20°C.	0.983 to 0.989
Ester Content, % by weight	99.0 Minimum
Cloud test	Clear at 0°C.
Containers	50-55 gal. non-returnable steel barrels.

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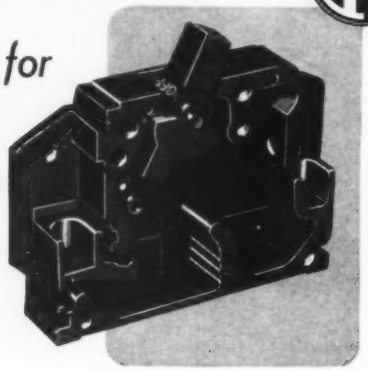

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IMPACT ON CAP LINERS. H. G. Steffens. Modern Packaging *23*, 121-5 (Nov. 1949). A method is described, including apparatus and statistical analysis of the data, for determining the impact resistance of cap liners.

STRAIN GAGES FOR LARGE PLASTIC STRAINS AND COMBINED STRESSES. J. Marin. ASTM Bulletin No. 161, 28-31 (Oct. 1949). Gages for determining large strains under combined stresses are described.

SPEED OF TESTING. F. G. Tatnall. ASTM Bulletin No. 161, 23-8 (Oct. 1949). Various papers on speed of testing of metals, concrete, plastics, and textiles are reviewed in this bulletin.

PHENOLIC MOLDINGS. R. V. Williamson. Brit. Plastics *21*, 328-30 (June 1949). The amount of material removed from a molded phenolic specimen during the immersion period in the water absorption test made in accordance with A.S.T.M. Method of Test D 570-42 was found to be as much as 58 times the amount found by direct weighings of the extracted materials. These false values may be the cause for rejection of an excellent molding compound. The determination of extractibles may be neglected in the water absorption test for phenolic plastics without altering for practical purposes, the relative values shown by the gain in weight from immersion.

WVP AT 0° BY MANOMETRIC METHOD. T. W. Sarge. Modern Packaging *22*, 127-9 (Sept. 1949). A method for measuring water vapor permeability of high-impedance barriers at 0° C. by a manometer technique is described.

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U. S. PLASTICS PATENTS

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POLYMERS. L. M. Minsk and W .O. Kenyon (to Eastman). U.S. 2,484,420. Oct. 11. Heating polyvinyl pyridine with a dialkyl sulfate or alkyl aryl sulfonate in solution in organic solvent.

POLYMERS. D. D. Reynolds and W. O. Kenyon (to Eastman). U. S. 2,484,423, Oct. 11. Reacting a polyvinyl cyclic amide with hydrazine hydrate, treating with an acid, separating, dispersing in water and precipitating the basic polymers.

CELLULOSE ACETATE. H. C. Staehle and C. F. Amering (to Eastman). U. S. 2,484,431, Oct. 11. Method of making hydrolyzed cellulose acetate printing plates.

CELLULOSE ESTERS. L. E. Herdle and E. L. Perkins (to Eastman). U. S. 2,484,455, Oct. 11. Method for continuous esterification of cellulose.

POLYTETRAFLUOROETHYLENE. K. L. Berry (to Du Pont). U. S. 2,484,483-4. Oct. 11. Dispersion in organic solvent of a copolymer of tetrafluoroethylene and another polymerizable material: means for laminating solid tetrafluoroethylene polymer surfaces with a dispersion of the polymer.

COPOLYMERS. H. J. Hagenmeyer (to Eastman). U. S. 2,484,501, Oct. 11. Copolymers of enol esters of diketones.

POLYVINYL ALCOHOL. H. J. Hagemeyer, Jr. (to Eastman). U. S. 2,484,502, Oct. 11. Replacing hydroxyl groups with halogen atoms by reacting polyvinyl alcohol with anhydrous halogen acid in the presence of a nitrile.

POLYAMIDES. W. R. McClellan (to Du Pont). U. S. 2,484,523, Oct. 11. Extruding linear polycarbonamide into a quenching bath and shaping in an uncrystallized state.

COPOLYMERS. H. E. Schroeder (to Du Pont). U. S. 2,484,530, Oct. 11. Copolymerizate of 3,3,3-trifluoropropene and an unsaturated hydrocarbon.

ELASTOMERS. M. M. Sprung (to G. E.). U. S. 2,484,595, Oct. 11. A heat curable synthetic elastic product containing a methylphenylpolysiloxane.

CREASE-PROOFING. M. Weisberg, A. S. Stevenson, and L. Beer (to Alrose Chemical). U. S. 2,484,598-9, Oct. 11. Crease-proofing and shrink-proofing treatments of fabrics with urea of melamine-formaldehyde condensates.

MOLDING. B. N. Sikka, G. Singh and L. C. Verman. U. S. 2,484,656, Oct. 11. Device for manufacturing containers from resin-impregnated laminations.

POLYMERIZATION. H. P. Standinger and D. Faulkner (to Distillers). U. S. 2,484,760, Oct. 11. A copolymer of vinylidene chloride, isobutene, and a monoethenic compound.

MOLDING. A. Ziska (to Ray-O-Vac). U. S. 2,484,777, Oct. 11. A plastic injection-molding machine.

COLLAPSIBLE TUBES. C. E. Slaughter (to Extruded Plastics). U. S. 2,484,965, Oct. 18. Collapsible tubes prepared by extruding heated thermoplastic resin.

COPOLYMER. H. P. Wohnsiedler and W. M. Thomas (to American Cyanamid). U. S. 2,485,079-80, Oct. 18. Colloidal aqueous solution of a copolymer of melamine, urea, and formaldehyde containing hydrochloric acid.

CONDENSATES. H. M. Cadot (to Du Pont). U. S. 2,485,187, Oct. 18. Incorporating a cellulose filler with a methylol monoethylene diurea and N-trimethylol melamine and thermally hardening.

UREA-FORMALDEHYDE. H. M. Kvalnes and F. S. Chance (to Du Pont). U. S. 2,485,203, Oct. 18. Heating urea with formaldehyde in alkaline solution and removing water with vacuum, thus giving a predetermined mixture of reaction product and free formaldehyde.

SURFACE FINISHING. W. H. Hickok (to Girdler). U. S. 2,485,238, Oct. 18. Surface finishing thermoplastic sheet by contacting with a caul and heating with high frequency.

POLYMERS. E. F. Izard (to Du Pont). U. S. 2,485,239, Oct. 18. Polymer obtained by hydrolyzing the interpolymer of allylidene diacetate and vinyl acetate.

ADHESIVES. F. K. Watson and P. Arthur, Jr. (to Du Pont). U. S. 2,485,248, Oct. 18. Pressure-sensitive adhesive coated with an ethylene-vinyl acetate copolymer plasticized with octadecandiol diacetate.

WOOL TREATMENT. P. Alexander and J. W. Bell (to Wolsey Ltd.). U. S. 2,485,250, Oct. 18. Treating wool with a solution of methylol urea, squeezing, drying, curing, treating with mineral acid, squeezing, and heating.

POLYMERIZATION. V. L. Folt (to B. F. Goodrich). U. S. 2,485,270, Oct. 18. Polymerizing chloroethylene in aqueous emulsion in the presence of an aliphatic amino-substituted alcohol.

CASTING. H. Gilbert (to B. F. Goodrich). U. S. 2,485,277, Oct. 18. Incorporating nitric oxide in a vinylidene compound, shaping, and heating below the boiling point whereby a clear, bubble-free casting is obtained.

PLASTICIZER. J. T. Gregory (to B. F. Goodrich). U. S. 2,485,281, Oct. 18. A thermoplastic vinyl halide polymer plasticized with an ester of a dicarboxy ketone.

COPOLYMERS. E. L. Kropa (to American Cyanamid). U. S. 2,485,294, Oct. 18. Interpolymerizing a mixture of a polymerizable unsaturated alkyd resin modified with tetrahydroabietyl alcohol and styrene.

INJECTION MOLD. E. H. Schwartz. U. S. 2,485,323, Oct. 18. A method and apparatus for producing ornamental multicolored designs. The injection head for use in the process is described in U.S.P. 2,459,048, Jan.

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dag DISPERSIONS

11, 1949, to B. Schwartz and E. H. Schwartz.

IMPREGNANT. H. Snow (to Southern Friction Materials). U. S. 2,485,-327, Oct. 18. The thermosetting heat-reaction product of an oil-soluble resin such as a phenol-aldehyde resin, petroleum pitch, and a drying oil.

INJECTION MOLDING. B. D. Ashbaugh (to H-P-M Development). U. S. 2,485,523, Oct. 18. Hydraulic injection of plastics as a continuous strip.

SEALING. P. H. Cardwell (to Dow). U. S. 2,485,527, Oct. 18. Forming a deposit in oil wells with two resinous compositions comprising phenol-formaldehyde and resorcinol- or phloroglucinol-formaldehyde.

POLYMERIZATION. H. F. Park (to Monsanto). U. S. 2,485,535, Oct. 18. Polymerizing styrene in the presence of ceric sulfate.

MOLDING COMPOSITIONS. G. A. Griess and E. D. Morris (to Dow). U. S. 2,485,592, Oct. 25. Molding composition of vinyl aromatic resin and a drying oil.

APPLYING PLASTIC. C. F. Hammann (to North American Research). U. S. 2,485,595, Oct. 25. Machine for applying plastic materials.

ETHYL CELLULOSE. M. T. Harvey (to Harvel Research). U. S. 2,485,-597-8, Oct. 25. A gel of ethyl cellulose and a reaction product of a terpene and formaldehyde.

COPOLYMERS. A. D. F. Toy (to Victor Chemical). U. S. 2,485,677, Oct. 25. A copolymer of vinyl acetate and diallyl isobutenyl-phosphonate.

EXTRUSION. S. B. Bogese (to Du Pont). U. S. 2,485,691, Oct. 25. Mixing finely divided polytetrafluoroethylene with prebaked polytetrafluoroethylene, die molding, and baking.

RESINS. G. L. Doelling and K. H. Adams (to Mississippi Valley Research Laboratories). U. S. 2,485,-711-2, Oct. 25. Alkaline reaction product of a 1,3-dihydric phenol and an aliphatic dihalide.

POLYMERIZATION. J. O. White (to Du Pont). U. S. 2,485,796, Oct. 25. Dispersing a vinyl compound in aqueous medium, adding an ethylene-vinyl acetate copolymer, adding ethylene, and polymerizing.

POLYMERIZATION. S. Whyte and D. D. Whyte. U. S. 2,485,798, Oct. 25. Introducing a monomer into a collapsible shell, immersing in a heating bath, applying a solvent, and stripping the shell.

MIXER. V. Zona (to Pirelli Societa Per Azioni). U. S. 2,485,854, Oct. 25. A mixer for plastic materials.

SHAPED ARTICLES. H. J. Lucas and F. R. Hepner (to U.S.). U. S. 2,485,-896, Oct. 25. Treating methyl methacrylate with hydrogen fluoride gas, deforming to a desired shape, and rigidifying by treating with air.

PLASTICIZERS. L. D. Myers and R. W. Webster (to Emery Industries). U. S. 2,485,910, Oct. 25. Mixing vinyl resin with an oxidized ester to plasticize it.

RESIN. E. S. Narracott (to Anglo Iranian Oil). U. S. 2,485,911, Oct. 25. Reacting aromatic hydrocarbon of petroleum with sulfur dioxide to produce a coating resin.

STRIP COATINGS. R. Ernst. U. S. 2,486,012, Oct. 25. Composition of chlorinated terphenyl, cellulose acetate butyrate, and a plasticizer.

ORGANO-SILOXANES. J. F. Hyde (to Corning Glass). U. S. 2,486,162, Oct. 25. A copolymeric organo-siloxane.

RESIN. R. R. Lawrence (to Monsanto). U. S. 2,486,182, Oct. 25. A vinyl chloride-containing polymer heat-stabilized with propylene glycoldiricinoleate.

POLYACRYLAMIDE. L. M. Minsk and W. O. Kenyon (to Eastman). U. S. 2,486,190-1-2, Oct. 25. An imidized polyacrylamide.

LAMINATES. D. G. Patterson (to American Cyanamid). U. S. 2,486,-201, Oct. 25. Methylated melamine-formaldehyde condensate and a mixture of styrene and unsaturated alkyd for use as a laminating resin.

POLYMERS. H. W. Arnold (to Du Pont). U. S. 2,486,241, Oct. 25. Method for preparing polymers and copolymers of acrylic acid nitrile in the presence of an alkali metal sulfite.

FILM PRINTING. M. A. Chavennes (to Chavannes Industrial Synthetics). U. S. 2,486,258-9, Oct. 25. Methods for decorating sheet resinous material.

PLASTICATING APPARATUS. T. Wachs (to R. C. A.). U. S. 2,486,346, Oct. 25. Apparatus for plasticating thermoplastic material with hot gas.

COPOLYMERS. W. O. Kenyon and C. C. Unruh (to Eastman). U. S. 2,486,370, Oct. 25. A copolymer of isopropenyl acetate and an ester amide.

COPOLYMER. A. B. Craig and D. T. Mowry (to Monsanto). U. S. 2,486,-376, Nov. 1. Copolymer of butadiene and bornyl methacrylate.

FURAN RESINS. A. P. Dunlop and P. R. Stout (to Quaker Oats). U. S. 2,486,392, Nov. 1. Resinous material resulting from heating partially polymerized monoalkyl furan and an aldehyde in acid medium.

POLYMERS. D. M. Gagarine (to Dan River Mills). U. S. 2,486,399, Nov. 1. Treatment of cellulosic textiles with polymeric polyhydric alcohol condensates.

LIGNIN RESINS. R. Katzen (to Diamond Alkali). U. S. 2,486,419, Nov. 1. Light-colored alkoxyl lignin halide resins.

EXTRUDING. G. E. Henning (to Western Electric). U. S. 2,486,474, Nov. 1. Apparatus for forming plastic coverings over filamentary strands.

SEALING COMPOSITION. W. P. Lowden (to R.C.A.). U. S. 2,486,487, Nov. 1. Potting composition of asphalt, n-butyl methacrylate polymer, and a cetyl acetamide wax.

CONDENSATES. L. H. Bock and J. L. Rainey (to Rohm & Haas). U. S. 2,486,495, Nov. 1. Surface-active sulfonated condensate of urea, formaldehyde, and an unsubstituted saturated aliphatic mono-alcohol.

MOLDING POWDER. J. M. Irwin. U. S. 2,486,601, Nov. 1. Ligno-cellulose molding powder prepared by digesting ligno-cellulose with heat and pressure in the presence of water and sulfur.

FAN. C. G. Troxler (to Hoover Co.). U. S. 2,486,619, Nov. 1. Plastic fan for installation in suction cleaners.

ADHESIVE. J. F. Murphy and R. Omdahl (to Monsanto). U. S. 2,-

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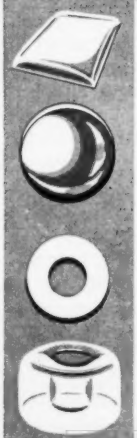

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WRITE FOR ENGINEERING AND PRODUCTION DATA BOOK!

486,756, Nov. 1. Aqueous emulsion adhesive comprising polystyrene, kaolin, plasticizer, an emulsifier, and sodium silicate.

COVERING. F. B. Pfeiffer (one-half to J. R. Crossan). U. S. 2,486,758-9-60-61, Nov. 1. Method and apparatus for covering an object with stretchable thermoplastic sheet.

FABRIC COATING. R. B. Seymour and G. M. Schroder (to H. H. Frede and Co.). U. S. 2,486,803-4-5-6, Nov. 1. Coating cellulosic fabrics with maleic anhydride—styrene copolymer and solid polyethylene glycol.

COPOLYMERS. P. L. Gordon (to American Waterproofing). U. S. 2,486,839, Nov. 1. Resinous copolymer of a vinyl ester of a saturated fatty acid with a poly-alkyl ester of aconitic acid.

VINYL ESTERS. E. Lavin and C. L. Boyce (to Shawinigan Resins). U. S. 2,486,855, Nov. 1. Polymerizing vinyl esters of saturated aliphatic acids in the presence of vinyl acetate-maleic acid copolymer.

POLYMERS. P. H. Carnell (to Phillips Petroleum). U. S. 2,486,-923-4, Nov. 1. Subjecting allyl halides to polymerization in the presence of hydrogen fluoride.

POLYMERIZATION. I. P. Hammer, J. B. Rust (to Montclair Research and Ellis-Foster). U. S. 2,486,943, Nov. 1. Polymerizing isopropenyl methyl ketone, methyl methacrylate, or acrylonitrile in aqueous solution with calcium thiocyanate.

LACQUER. E. O. Ohlmann (to Dow). U. S. 2,486,971, Nov. 1. Coating of ethyl cellulose and a binary cyclohexanone-formaldehyde condensate in an alcoholic solvent non-solvent for polystyrene.

ORGANOSILICON COMPOUNDS. F. J. Sowa. U. S. 2,486,993, Nov. 1. Condensates of alkyl esters of tartaric or lactic acid and an organosilicon compound.

LAMINATES. A. M. Marks. U. S. 2,487,063, Nov. 8. A polyvinyl butyryl silicate polarizer laminate.

TUBULAR ARTICLES. G. V. Morey, U. S. 2,487,067, Nov. 8. Method for making tubular articles from plastic sheet materials.

STABILIZER. C. J. Chaban (to Stabelan Chemical). U. S. 2,487,099,

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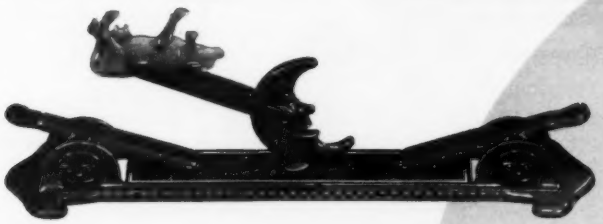

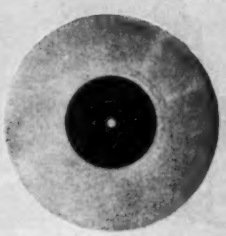

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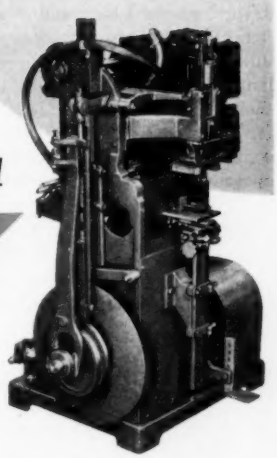

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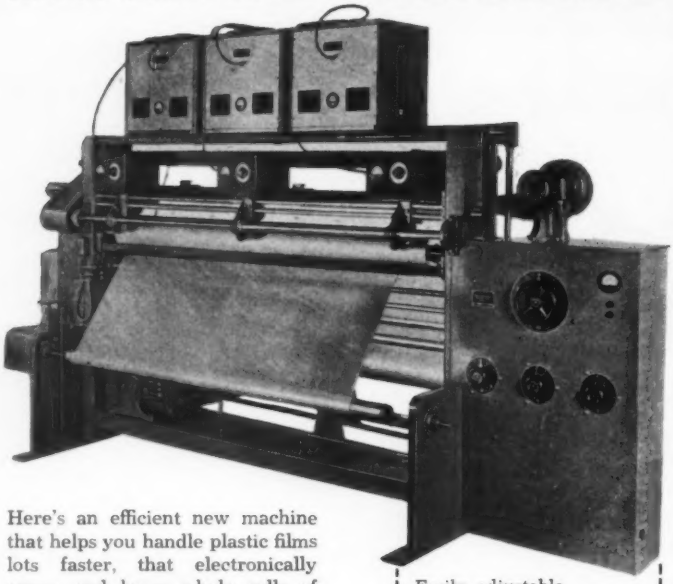

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Nov. 8. Incorporating sodium perborate with polymerized alpha-chloro substituted ethylene.

MOLDING COMPOSITION. R. T. K. Cornwell (to American Viscose). U. S. 2,487,105-6, Nov. 8. Molding composition of thermoplastic or thermosetting substance plasticized with an ester of an aliphatic acid and an N-hydroxyalkyl cyclic amide of an aromatic dicarboxylic acid.

ADHESIVE. M. E. Cupery (to Du Pont). U. S. 2,487,223, Nov. 8. Thermosetting adhesive composition of solvent formaldehyde, acid catalyst, and a polyvinyl butyral.

COATINGS. P. L. Mahoney (to U. S. Rubber). U. S. 2,487,254-5, Nov. 8. Strip coating for thermoplastic resins comprising aqueous suspenion of castor oil plasticized polyvinyl acetal resin.

SYNTHETIC RESIN. A. Champagnat and R. Willer (to Societe Generale des Huiles de Petrole) U. S. 2,487,-309, Nov. 8. Condensing "red oil" with a phenol and formaldehyde in the presence of an acid catalyst.

UREA RESINS. R. F. Stierli (to Harvel Research). U. S. 2,487,394, Nov. 8. Heating a mixture of urea, formaldehyde, and a liquid furfuryl alcohol-formaldehyde condensate.

MOLDING. W. P. Cousino (to Chrysler). U. S. 2,487,426, Nov. 8. Injection molding of thermosetting material.

ADHESIVES. R. W. Kingerly, Jr. (to Du Pont). U. S. 2,487,448. Nov. 8. Dispersing and heating in water a mixture of unswollen starch, polyvinyl alcohol, and kaolinitic clay to produce an adhesive for cellulosic materials.

SHEET MATERIAL. R. F. Taber. U. S. 2,487,494-5, Nov. 8. Method and device for folding plastic sheet.

ADHESIVE. C. H. Schmidt (to American Cyanamid). U. S. 2,487,-766, Nov. 8. Adhesive comprising an aqueous dispersion of melamine or urea-formaldehyde resin and sodium carboxymethyl cellulose.

ACRYONITRILE. J. B. Dickey, T. E. Stanin, and H. W. Coover, Jr. (to Eastman). U. S. 2,487,859, Nov. 15. A polymer of acrylonitrile dissolved in an organic phosphorus compound.

As an added safety feature, all Model "J"

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come equipped with a BLADE GUARD. This guard is located between the Left Frame and Guides. It covers the exposed cutting portion of the blade as a means of protection. The Guard can be readily removed to change blade. Model J (illustrated), heavy, sturdy, cuts 10" rounds, 18" flats.

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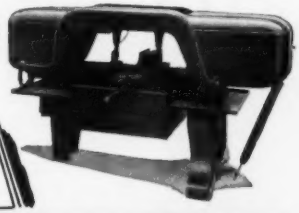

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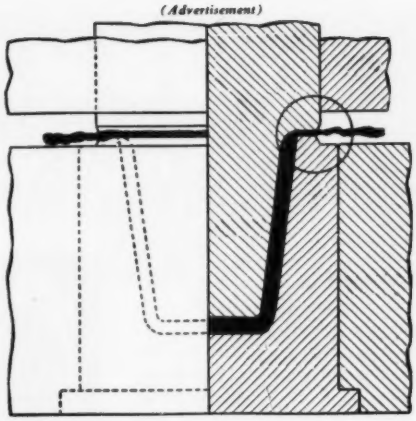

Molds for Plastics

It sounds foolish to say that molds are what you make them, but they are, and can be a definite headache for that reason. When a customer buys the cheapest mold that is offered to him, he may easily be heading for trouble. That same purchasing agent would throw up his hands in horror if some one proposed that he buy the cheapest available truck to tote his goods around. He knows well that there are other things to trucks than price. He would say that upkeep and continuity of service were important too, and that he was willing to pay for the insurance of these two items in the original cost.

Because the mold is in some one else's shop, and that some one else is assuming the responsibility for these items, is not enough to justify ignoring the quality of the mold to be purchased. Regardless of the blame being placed elsewhere for a breakdown in production, the purchasing agent will be the one to hear from the front office.

The most talented molder in the world cannot make a bad mold stand up to a heavy schedule. In fact, 90% of molding troubles, from accuracy to ultimate delivery, are traceable to inferior molds or mold design. And most of these in turn trace back to pressure from some ambitious client who decided he would save money on the molds after the piece price had been settled. Add to that, of course, a weak, hungry molder, who yielded in the hope that this time he could get away without trouble. Sometimes he does.

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DRY MIXER—From 300 to 600 lb. of polystyrene can be colored hourly on the Jamison Dry Mixer which blends dry colors and crystal polystyrene to produce injection-molded parts. Manufactured by H. Jamison, Freeport, L. I., N. Y., the unit has a capacity of 100 lb. per cycle. The principal part, a 49-lb. drum, can be changed in less than a minute. Thorough mixing of dry color and

crystal is accomplished in from 10 to 20 min., with accurate control provided by an automatic timer and an inching switch. Power is supplied by a ½-hp, 110-v., 60-cycle, AC motor. A major objective of the equipment is to permit making of colored plastic products as they are needed, and to eliminate the cost and problem of stocking colored material. Jamison provides extra drums for handling different colors, and also offers a line of stock colorants (including mahogany and black), as well as special colors. Drum can be changed as easily and rapidly as the cover of a plastic powder fiber shipping drum.

The 22-gage, galvanized steel drum has a diameter of 27 in. and a height of 28 inches. Atop the drum is a cover which is an internal friction fit. The entire unit, which occupies floor space of 48 by 48 in., has a charging height of 65 in., a discharging height of 32 in., and operates at a speed of 25 r.p.m.

In action, two 50-lb. bags of crystal polystyrene are placed in a drum, to which is added the complete contents of one package of colorant. The drum is covered, the General Electric automatic timer (provided with automatic reset) is set, and the machine is started. After operation ceases, the cover is removed, and the drum is tipped until empty, with the inching switch employed if necessary. Mixing time for opaque colors is 20 min., while transparent colors require 10 min. for mixing.

TESTING MACHINE—Standard tensile, compression, and transverse tests on plastics, metals, bricks, plywood, textiles and other materials can be conducted with accuracy on the new LC-Type Machine and Tools, according to the manufacturer, Tinius Olsen Testing Machine Co., Easton Rd., Willow Grove, Pa. Provided with dual-capacity ranges of 10,000 and 1000 lb., the machine is guaranteed to meet Army, Navy, Federal, and A.S.T.M. specifications. The unit is available in two models: hand operated and motor driven.

IMPULSE TIMER—Modifications and new construction concepts are incorporated in the improved Model RT Zenith Impulse Timer introduced by Zenith Electric Co., 152 W. Walton St., Chicago 10, Ill. Designed without gears or clutches, the instrument is said to provide impulse circuits for production line control and pilot circuit, and on-and-off circuits for mixing and molding machinery and laboratory testing equipment. Another control produced by the firm is a manually pre-set interval timer, adaptable to plastic molding, heat treating, enamel baking, and other operations. The instrument features a setting knob directly connected to the switch-operating cam; the unit does not set through a clutch—thus providing the control with positive switch action.

HYDRAULIC CYLINDERS—A new and extensive group of hydraulic (oil) cylinders for industrial service has been added to the line of products manufactured by Vickers, Inc., 1446 Oakman Blvd., Detroit, Mich. Features claimed for the new cylinders include: improved head seals; multiple piping connection positions; universal mounting positions; special self-adjusting packings; and adjustable hydraulic cushions. Design follows practice recommended by JIC Hydraulic Standards for Industrial Equipment.

LIQUID FILTERS—Development of a Synclinal filter for use on injection presses and other equipment involving hydraulic power systems has been announced by Marvel Engineering Co., 625 W. Jackson Blvd., Chicago 6, Ill. Made for both sump and line installations (with housing), to meet the particular operating conditions involved, the filters are placed in the sump or on the line ahead of the pump. They prevent particles of dirt, pipe scale, etc., from entering the hydraulic system, where they would cause damage to pump gears, interfere with valve operation and decrease

(Continued on page 139)

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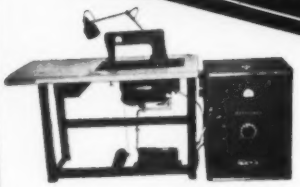

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Hubley Manufacturing Co., Lancaster, Pa., produced this hob; Newark Die Co. hobbed the cavity.

YOU CAN REDUCE CAVITY COSTS *UP TO 500%...*

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Are you trying to trim costs on a new product to be made of plastic or rubber? Then call in one of our engineers, or mail us your blueprints. We'll tell you whether you can use a hobbed cavity instead of an expensive machined mold. If you can, you'll be amazed when we tell you how much you can save.

Our modern hobbing equipment includes a battery of 7 presses... ranging from 100 tons to 2,500 tons in size... capable of sinking a hob up to 25-30 sq. in., in blank sizes up to 8" wide by 13½" long. And, if you wish, we can make the hob as well as the hobbed cavity.

Send for your free copy of "The Procedure of Die Hobbing."

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hydraulic pressure. Designed to provide the greatest possible filtering area in the smallest amount of space, the filters include a removable insert which is easily cleaned with a suitable solvent, restoring the original efficiency of the unit. All component parts can be easily replaced if necessary.

THERMOPLASTIC MELTER — Electric heating and thermostatic control of temperatures are the principal highlights of the Magnaflow Melter, a new piece of equipment for melting

thermoplastic materials. Manufactured by Kellogg, 603 So. Rampart St., Los Angeles 5, Calif., the unit has a capacity of 200 lb. of hot melt compound. An automatic clean-out device is attached to hopper base.

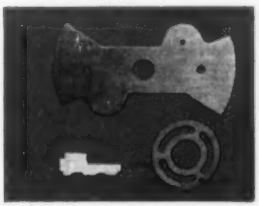
MULTI-ANGLED BELT GRINDER—A belt grinder which can be set at any angle has been announced by Harvey L. Ramsay & Co., 636 So. Tenth Ave., La Grange, Ill. Known as the Expeditor, the unit is mounted on an axis that centers at the motor shaft; it may be used in conjunction with other Expeditors in an arrangement which permits the operator to rough, semi-finish, and finish grind with a minimum of lost motion.

Designed for free belt operation, form wheel work or contour grinding, line contact grinding, and platen precision grinding, the Expeditor can be set up over a turntable or moving belt while operations pass beneath to be reduced to proper size, rough and finish ground, polished, and dropped out automatically.

GCA, for Ground Controlled Approach, is aviation's most important navigation aid.

Many hundreds of pilots owe their safety to GCA systems built by the Los Angeles firm of Gilfillan, manufacturer for USAF and CAA.

AT THE HEART OF the Gilfillan CCA system is the terminal board, above. Gilfillan engineers chose Formica for this vital component on the basis of outstanding arc and heat resistance. "The grade that makes the grade," in this case, is Formica G-6—a glass fabric base plastic laminate, bonded with silicone resin. Low moisture absorption is another "plus value" offered by Formica glass-silicone grades.



FORMICA IS AVAILABLE in more than 40 "standard" grades, each high in electrical, mechanical or chemical resistant properties, whichever is most desirable. Formica sales-engineering research is continually developing special grades for specific applications in sheet, tube, rod or molded form. This service is always available to help solve your laminated plastics problems. Write FORMICA, 4531 Spring Grove Ave., Cincinnati 32, Ohio.

FORMICA GLASS-SILICONE GRADES also offer low dielectric losses in radio and power frequencies, and are highly resistant to chemicals.

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BOOKS AND BOOKLETS

Write for these publications to the companies listed. Unless otherwise specified, they will be sent gratis to executives who request them on business stationery.

Acetylene and Carbon Monoxide Chemistry, by John W. Copenhaver and Maurice H. Bigelow.

Published by the Reinhold Publishing Corp., 330 West 42nd St., New York 18, N. Y. Price $10. 357 pages.

This is the first critical treatment of the chemistry of acetylene under pressure and describes in detail the major chemical processes based on acetylene, with particular reference to the new developments in Germany and this country.

The book presents the development of the chemistry of acetylene under pressure and its application to the four major fields of vinylation, ethinylation, polymerization, and carboxylation. Also considered are the hazards involved and the techniques and equipment that have been developed for safe handling of this element. The newer phases of carbon monoxide chemistry are discussed along with cheaper processes for producing high grade resins, synthetic oils, organic chemicals, synthetic rubbers and textile fibers. Actual operating conditions and yields for many processes are reported; all information, particularly that offered by the Germans, has been checked for accuracy.

Temperature indicators—Two new thermometers added to the GE line of temperature indicators for industrial and laboratory use are analyzed in an 8-page bulletin, GEC-565. Measuring temperatures up to 3000° F., the thermocouple thermometer is useful in industrial applications—galvanizing vats, melting pots, furnaces, and ceramic kilns. The resistance thermometers, designed for accurate recording of low temperatures up to 300° F., are used for generator- and transformer-winding temperature indication, refrigeration and air conditioning testing, drying operations, and scientific laboratory work. Also included is a short article on resistance detectors and a tabular presentation of pricing information on the various models. *General Electric Co., Schenectady 5, N. Y.*

Tenite injection molding—Injection molding of Tenite I and II, cellulose acetate and cellulose acetate butyrate, is described in this 55-page booklet. This enlarged third edition contains information on the choice of material, product design, injection-molding machines, mold design and construction, and various finishing processes. A large section is devoted to drawings of such typical injection-mold designs as bottle caps, knobs, and salt and pepper shakers. Also included is an outline of common molding problems, their causes, and suggested solutions. *Tennessee Eastman Corp., Kingsport, Tenn.*

Testing facilities and methods used on Fiberglas products—The facilities and procedures used by Owens-Corning in its testing laboratories to ascertain data on properties, uses, and performance characteristics of Fiberglas materials are presented in this 36-page booklet. Among the Fiberglas materials whose tests are described are thermal and acoustical materials, filter and mat and reinforced plastics products, textiles, electrical insulations, and the raw components of Fiberglas. The text is illustrated with shots of laboratory equipment and personnel in action. *Owens-Corning Fiberglas Corp., Toledo 1, Ohio.*

Acrylic for outdoor signs—A pictorial representation in color of the use of Plexiglas acrylic plastic in outdoor signs is incorporated in a 20-page booklet, "Plexiglas, The Outdoor Plastic for Signs." Depicting the extensive possibilities in color and lighting treatments that can be achieved with this material are 30 illustrations of recent applications. The properties of Plexiglas are listed, as well as size and thickness specifications. *Rohm & Haas Co., Washington Sq., Philadelphia 5, Pa.*

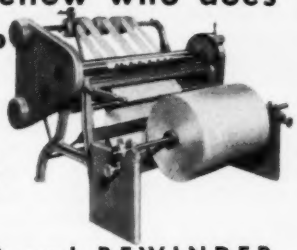
Lactic acid and lactates—Prepared originally for the Sugar Research Foundation, this 30-page publication is now available to the public. The report discusses the processing of a plastic grade of lactic acid from blackstrap molasses at an estimated low cost that eliminates competition from other alternate raw materials such as cereal grains, sulfite waste liquors, and milk whey. Already an important product in the food packing and chemical industries, the use of a low-price lactic acid as a base in the manufacture of alkyd, cast phenolic, and acrylic resins is claimed by the author to open up vast markets in the plastics industry. *R. S. Aries & Associates, 26 Court St., Brooklyn 2, N. Y.*

Supervisor's management guide—Designed to bring the newest developments in management thinking and methods to supervisors and operating executives, this comprehensive manual covers such aspects of the managerial job as: Building Job Satisfaction and Enthusiasm; Preventing Grievances; Developing Leadership Qualities; Improving Communication with Employees; Handling the Problem Worker; Increasing Productivity; and Controlling Absenteeism. *American Management Association, 330 West 42nd St., New York, N. Y.*

Laminated plastic—The automotive, aeronautic, railroad, and marine industries will be interested in this brochure illustrating specific uses for Parkwood Decorative, a permanently finished laminated plastic for interior uses. The brochure contains color photographs of installations in which the company's material is used for table tops and furniture surfaces, along with other suggested interior applications. *Parkwood Corp., 34 Water St., Wakefield, Mass.*

Web handling and processing—Equipment and systems for handling and processing textiles, papers, films, and foils are analyzed in a 24-page booklet, "Blueprint for Industry, Part V." Web handling equipment

A little fellow who does a big job



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Making little rolls out of big ones can be profitable production for you on the Jacques Slitter and Rewinder. It's precision built with new, improved features to handle a variety of materials faster at least cost. Easy to operate. Rolls quickly changed. Micrometer friction adjustments made while machine is in operation. Counter, switch and friction controls conveniently located.

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Sterling R	General purpose black extender

CABOT Godfrey L. Cabot Inc.

*These, for good electrical conductivity in electrostatic applications

includes various types of letoffs, coaters, dipping machines, drive rolls, oven units, tensioning devices, and system drives. The web processing systems described are impregnators for tire cord, cotton and rayon webs and paper, paste-coating fusing ovens, rubber cementers and adhesive coaters, organosol coating systems, aniline ink, cut stock dryers, and foil and film coaters. *Industrial Ovens, Inc., 13825 Triskett Road, Cleveland 11, Ohio.*

Packaging and paper lacquers—The results of extensive research on nitrocellulose packaging and paper lacquers are offered in this 32-page booklet which describes the formulations and materials used in the study. Papers coated with many different compositions containing four plasticizers and nine resins were investigated—and their properties of flexibility, grease resistance, scuff resistance, and color stability are reported as well as the effect of the resin and plasticizer on these properties. Also included are suggested starting formulations for paper-coating lacquers. *Hercules Powder Co., Wilmington, Del.*

Fabrication of polystyrene—Recommended techniques for machining and working with polystyrene are summarized in an 8-page booklet. The guide covers the use of coolants, sawing, turning, milling, drilling, threading, tapping, grinding, annealing, polishing, forming, cementing, die-cutting and checking for stresses. *Plax Corp. Div., Hartford-Empire Co., P. O. Box 1019, Hartford, Conn.*

Adjustable speed drives—A summary of the specific benefits which various branches of modern industry can expect from properly applied adjustable speed is presented in this 24-page booklet. Case histories show how adjustable speed has stepped up production, made machines more versatile and helped turn out better products, along with the other advantages of reduced waste of material, lower maintenance, and low cost of modernization. Equipment covered in the publication includes AC and DC adjustable speed motors, packaged adjustable speed drives, and various electronic devices which provide adjustable speed. A section is devoted to a comparison chart showing the performance features and characteristics of five adjustable speed drives, a varying speed drive, and a multi-speed drive. *General Electric, Schenectady, N. Y.*

Pulverizers and dust collectors—The company's complete line of Mikro pulverizing and dust collecting equipment is set forth in this 50-page booklet. Included is a discussion of applications of Mikro equipment in the production and handling of fine and ultra-fine powders for a variety of materials—such as chemicals, colors, dyestuffs, pigments, cosmetics, soaps, resins, sugar, food products, plastics, insecticides, fertilizers, limes, minerals and metals. In addition, there are complete descriptions of the various types of Mikro-Pulverizers for precise particle control, and of the Mikro-Atomizer, designed for ultra-fine grinds in the lower micron ranges. *Pulverizing Machinery Co., 245 Chatham Road, Summit, N. J.*

Laminated plastic review—The most recent applications of Formica and the latest developments of the company's engineers are presented in this quarterly publication. Photographs illustrate the use of the material in kitchens, offices, restaurants, trains, and banks along with its industrial application in a boring, drilling, and milling machine and an aircraft pulley. Also included is a complete color range which shows the various finishes in which the material is available. *The Formica Co., 4614 Spring Grove Ave., Cincinnati 32, Ohio.*

Controlled humidity method of air conditioning—A process by which air is dehumidified is described in this 2-page bulletin. Hygrol, an absorbent liquid, is used to remove moisture directly from the air. *Niagara Blower Co., 405 Lexington Ave., New York 17, N. Y.*

Plastics molding press—A self-contained, semi-automatic, general-purpose molding press, which meets the demand for molding large parts having deep draws and heavy sections, such as radio cabinets and telephone bases, is described in a 4-page folder. Machine advantages, specifications and views of some typical molded parts are also included in this analysis of the 200-ton unit, known as Model 723. *F. J. Stokes Machine Co., Philadelphia.*

Lustrex styrene latices—The physical characteristics of plasticized and unplasticized emulsions are contained in this 8-page booklet. Also included are suggested procedures for compounding and handling Lustrex latices. Three graphs illustrate viscosity control through use of thickness. *Monsanto Chemical Co., Plastics Div., Springfield, Mass.*

Resin emulsions for textile finishes (Bulletin P-5)—A series of ten Polysize Emulsions used as raw materials for compounding finishes for cotton, rayon, silk, nylon and linen are discussed in this bulletin. These emulsions are free-flowing dispersions which are easily diluted in water and may be readily adapted to all common methods of finishing textiles—padding, tumbling, spraying, and knife and roller coating. Also included are descriptions of methods used in applying the emulsions, formulas and finishing procedures and characteristics of the finish imparted. *American Polymer Corp., 101 Foster St., Peabody, Mass.*

Solvents and solvent oils—A technical description of the important solvents and solvent oils produced by the company is outlined in this 6-page brochure. The booklet describes the characteristics and gives typical analyses of the company's aromatic petroleum naphthas, coal tar naphthas, heavy naphthas, and solvent oils.

Useful related information covers evaporation rates and their meanings, solvent power analysis, solvent-handling explosive mixtures, and physiological actions of solvents. *Pennsylvania Industrial Chemical Corp., Clairtown, Pa.*

Formaldehyde technical data—Complete information on formaldehyde is offered in this 30-page booklet. The revised edition covers specifications, physical properties, uses, methods of analysis, storage and handling, and unloading of the material. *Celanese Corp. of America, Chemical Div., 180 Madison Ave., New York, N. Y.*

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ROHM & HAAS COMPANY

THE RESINOUS PRODUCTS DIVISION

Washington Square Philadelphia 5, Pa.

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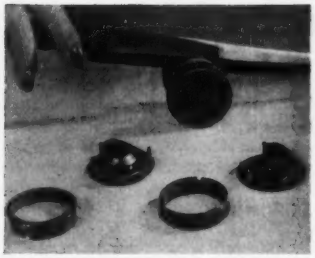

Cylindrical housing for grindstone has four cellulose acetate sections

Knife Sharpener

COMPACTABILITY and safety have been incorporated in a pocket knife-sharpener with a plastic housing developed by The Alden Speare's Sons Co., Cambridge, Mass. Constructed in the shape of a telescopic cylinder which opens for action with a half-turn twist of the fingers, the Rolit knife grinder consists of a grindstone surrounded by two cellulose acetate wheels. When the sharpener is in use, the knife blade is supported at the correct grinding angle by resting it against one of the plastic wheels.

The Rolit grinder—which derives its name from the rolling action involved in the sharpening operation—is made of Tenite I which was selected as a tough plastic that would withstand the abuse to which such a device is subjected. The four cellulose acetate parts are molded for Speare's by John R. Sloane, Lexington, Mass.

To eliminate the difficulties of producing a molded-in thread in the plastic end pieces, each of the two plastic rings enclosing the grindstone has been molded in two pieces instead of one. When the pieces are assembled, they form a cylinder whose interior grooves simulate an undercut thread without requiring the use of cams in the molding machine.

As the plastic cylinders are twisted into the open position, a metal disk with lugs rides up on the thread bringing the grindstone into position for use.

The Rolit has been designed to prevent flaking of metal from blades as knives are sharpened.

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BECAUSE we have been

Outfitters to Plastics Mfrs. Since 1911

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Engineering	Keller Work	Degating Equipment
Design	Heat-treating	Stan-Casts (Stainless Steel Castings)
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Hobbing	Pantographing	

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for LAMINATING and MOLDING
high pressure • low pressure

PHENOPREG materials are resin impregnated papers, fabrics and fiberglas for laminating and molding by the application of heat and pressure. They offer untold possibilities for the production of molded laminates, structural assemblies, laminates, reinforcements for molding compounds, core stocks and many other applications.

PHENOPREG LP—BCM resin treated Fiberglas fabrics

- Supplied ready for lay up assembly and curing under heat and pressure without further processing by the purchaser.
- For plane parts which require high strength/light weight ratio. Available in electrolytic corrosion resistant and flame resistant formulations.
- Also for fabricating drill jigs, routing fixtures and other production tools.
- Can be laminated at 15 psi and upward. Cure temperatures above 250°F. are recommended.

We invite your inquiries about standard and special grades of PHENOPREG materials. Ask for a sales engineer to assist with your technical problems.

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PLASTICS DIVISION

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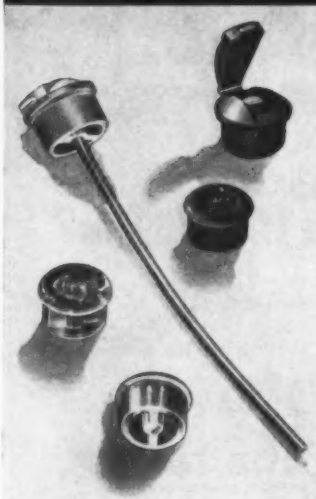
SPRAYING the SQUEEZE



Use of squeezable bottles is made more convenient and economical with atomizers developed by Shaw. Combining the functions of cap and sprayer in one unit, these Atom Heads, as they are called, are molded by Shaw in a single operation — using polyethylene, polystryene or other materials.

Shaw is also equipped to mold other types of closures and custom molded products in large volume at lowest cost. On any plastics application, it pays to see Shaw first.

SHAW

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160 COIT STREET, IRVINGTON 11, N. J.

Production of

FOR THE purpose of this report, production is the sum of the quantities of materials produced for consumption in the producing plant, for transfer to other plants of the same company, and for sale. Sales include only the quantities involved in bona fide sales in which title passes to the purchaser.

The figures of sale given in the present report are not comparable with those for consumption in the producing plants plus shipments to other plants

PLASTICS AND SYNTHETIC RESIN PRODUCTION
From Statistics Compiled

Materials	*Total Prod'n first 11 mos. 1949*
CELLULOSE PLASTICS:[a]	
Cellulose acetate and mixed ester plastics:	
Sheets, continuous:	
Under 0.003 gage	6,345,282
0.003 gage and over	7,246,712
All other sheets, rods and tubes	3,935,956
Molding and extrusion materials	51,250,816
Nitrocellulose:	
Sheets	5,237,252
Rods and tubes	1,334,575
Other cellulose plastics[b]	7,020,668
PHENOLIC AND OTHER TAR ACID RESINS:	
Laminating	36,756,031
Adhesives	24,763,852
Molding materials[a]	115,140,830
Protective coatings (containing less than 10% modifier)	15,636,383
Miscellaneous uses, including casting	39,526,806
UREA AND MELAMINE RESINS:	
Adhesives	38,201,416
Textile- and paper-treating resins	26,718,798
Protective coatings, modified and unmodified	16,750,157
Miscellaneous uses, including laminating and molding[c]	43,009,165
STYRENE AND STYRENE DERIVATIVE POLYMER AND COPOLYMER RESINS:	
Molding materials[a]	166,648,487
Miscellaneous uses[d]	26,700,236
VINYL RESINS:	
Sheeting and film, including safety-glass sheeting[a]	140,978,276
Adhesive (resin content)	10,798,564
Textile- and paper-treating resins, including spreader and calendering types (resin content)[a]	26,517,018
Molding material (resin content)	71,256,177
Miscellaneous uses (resin content)[a]	15,769,438
MISCELLANEOUS SYNTHETIC PLASTICS AND RESIN MATERIALS:	
Molding materials[a, f]	40,577,642
Protective coatings[g]	46,041,742
All other uses[h]	142,776,680

[a] Includes fillers, plasticizers, and extenders. [b] Includes sheets, rods, and tubes, and molding and extrusion materials. [c] Data on resins for laminating and miscellaneous uses are on a dry basis; data on molding materials are on the basis of total weight. [d] Excludes data on protective coating resins; these data are included with miscellaneous coating resins to avoid disclosure of operations of individual companies.

Plastics Materials

given in earlier reports. The figures for production given in the present report, however, would be comparable with figures for consumption in producing plants plus shipments given in earlier reports except for inventory changes. From month to month these changes in inventory may be substantial in amount, but over a period of several months the figures will tend to even out.

IN POUNDS FOR OCTOBER AND NOVEMBER, 1949
by U. S. Tariff Commission

October 1949		*November 1949*	
Production	*Sales*	*Production*	*Sales*
774,942	899,862	678,698	691,157
845,340	868,125	898,071	767,707
517,524	412,648	415,284	321,876
6,903,604	6,499,399	5,182,807	5,118,021
361,209	456,719	334,036	381,507
92,278	114,018	105,709	112,731
748,956	748,331	423,442	423,921
3,757,216	2,633,746	3,954,173	2,604,856
2,736,225	2,553,361	2,649,518	2,440,883
14,608,399	14,830,447	17,721,177	14,769,680
1,683,775	1,294,155	1,763,795	1,097,702
3,954,235	4,011,201	4,931,539	4,828,038
4,867,420	4,645,150	5,014,680	4,720,238
3,451,588	2,725,689	3,497,112	3,006,530
2,382,537	1,934,614	2,174,411	1,647,005
4,920,311	4,727,203	4,800,631	4,715,679
18,817,896	18,776,891	17,904,390	18,711,862
3,337,682	2,805,832	2,996,228	2,552,681
17,354,034	17,751,267	18,170,634	17,704,784
1,315,539	1,191,861	1,244,731	1,133,647
2,675,347	3,045,017	3,094,218	2,954,098
9,057,763	8,819,407	9,254,235	8,675,776
1,383,438	669,163	1,739,618	956,996
4,074,481	3,610,286	3,516,618	3,875,893
5,243,773	5,429,557	5,168,203	5,098,051
14,821,482	14,798,619	15,192,173	14,314,322

[a] Includes data for spreader and calendering type resins. [c] Includes data for acrylic, polyethylene, nylon, and other molding materials. [g] Includes data for coumarone-indene, petroleum, silicone, and other protective coating resins. [h] Includes data for acrylic alkyd, coumarone-indene, nylon, petroleum, silicone, and other plastics and resins for miscellaneous uses. [r] Revised.

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- All Colors Stable to 1500°F—some to 2300°F
- Will Not Change Shade Under Heat and Pressure
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- Blend Exceptionally Well With Raw Materials
- Suspend Well in Water Solutions
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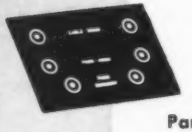

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London Letter

News and Notes on Trends in the Manufacture and Application of Plastics in Britain

OF interest to molders in Great Britain are the new automatic control units for hydraulic presses developed by Arcolectric (switches) Ltd., West Molesey. In contradistinction to the American type of automatic press control which operates on piston valves only, the British control unit operates the screw-down type of valve. The latter is simple, maintenance costs are low, and it is the only satisfactory type of valve to use on an accumulator supply.

To overcome the optical defects of ordinary glass lenses with spherical surfaces, a series of well-corrected aspherical lenses made of acrylic resin has been computed by I.C.I. They are sold under the name of Transpex Industrial Inspection Lenses.

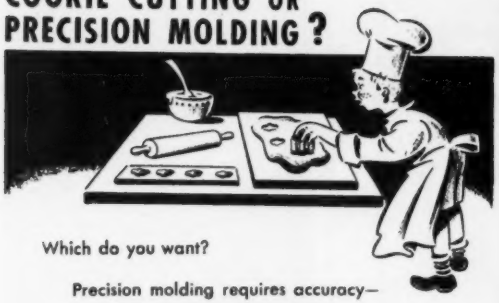
For some applications, semi-rigid p.v.c. is replacing leather. A new sheathing for the flexible metal lead of a dentist's drill is made of soft p.v.c., and at the end of the lead near the drill is a sleeve made of hard p.v.c. This sleeving used to be made of leather, which tended to fray with use.

Molders hoped that bulk supplies of polystyrene would be available in the early part of 1950, but Erinoid, Ltd., which is associated with Petrochemicals Ltd., in the manufacture of styrene and its derivatives, reports that owing to unforeseen delays in the delivery of certain equipment, there is likely to be further delay. It is unlikely that British molders will be able to draw freely upon home supplies for some months to come.

Great improvements have taken place in the fabrication of small novelties, toys, and fancy goods made of p.v.c. calendered sheet. Largely responsible for this improvement is the increasing use of new automatic press welders which are capable of welding articles up to a size of 18 by 4 in. in a single operation. The firm of Redifon Ltd. is specializing in this type of equipment which can be operated without any technical skill.

—*John S. Trevor.*

COOKIE CUTTING OR PRECISION MOLDING?



Which do you want?

Precision molding requires accuracy—experience—engineering—high technical skill—complete "know how" to design your piece, work out your problems, produce your piece to your complete satisfaction.

On the other hand, cookie cutting—well!

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Sandy Hook Connecticut

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1 College level degree training in Mechanical Engineering with specialization in Plastics Processing.

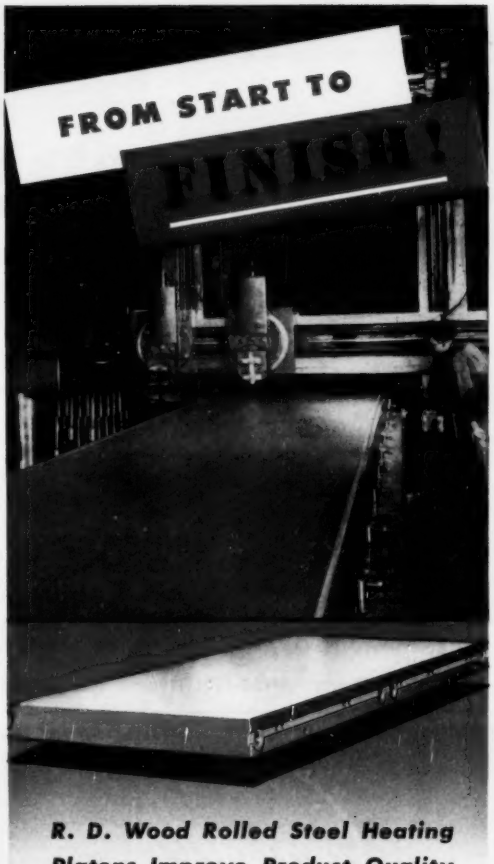
2 Resident training, intensive and practical—Plastics Fabrication—Plastics Technician.

3 Home Training, for up-grading plastics industry personnel or as preparation for worthwhile employment in the industry.

West Coast University invites the cooperation of the plastics industry in the continuing development and improvement of practical programs of plastics education and training.

INDUSTRY REQUESTS FOR TRAINED PERSONNEL GIVEN PROMPT ATTENTION

Plastics Industries Technical Institute
department of WEST COAST UNIVERSITY
1601 South Western Avenue, Los Angeles 6, California



R. D. Wood Rolled Steel Heating Platens Improve Product Quality

PLASTIC or rubber product quality frequently starts at the *finish!* Processing operations—polishing, laminating, bonding, protective coating, and curing—depend in large measure on the *finish* of press heating platens. Widely accepted throughout industry, R. D. Wood rolled steel heating platens are *precision* made in any practical size for the most exacting work. Platen finish is superb, surfaces are machined *parallel*, uniform heat distribution and permanent steam closure are rigidly maintained. Put the *finishing* touch to *your* products by getting the full story from R. D. Wood engineers.

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ACCUMULATORS [illegible] INTENSIFIERS

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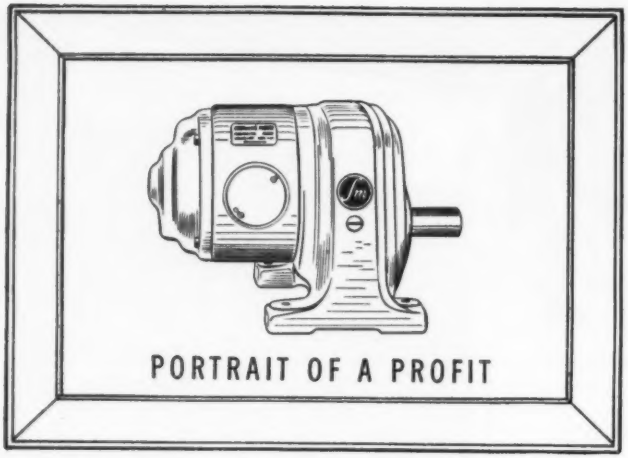

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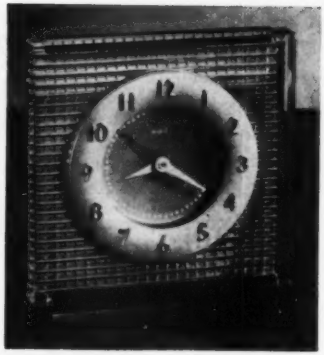

Modern design acrylic alarm clock is made by three-dimensional molding

Alarm Clock

WHEREAS modern design usually represents a departure from long-accepted concepts, it is possible to construct streamlined products so that they will fit equally well into either contemporary or traditional decorating schemes. Such is the theme that underlies the El-Dorado acrylic electric alarm clock which was recently introduced to the market by Allied Precision Industries, Chicago, Ill. This new clock is a creation of Raymond Loewy Associates.

In the past, three-dimensional acrylic molding, where details have been filled in with color from the rear, has been limited to use in decorative parts, and many additional fields of application have remained relatively unexplored. The El-Dorado alarm clock constitutes one of the latest products to make effective use of this process.

The face of this distinctively-styled timepiece, which is suitable for home or office, is a solid block of molded clear Lucite measuring approximately 5 in. square and weighing about 6 ounces. The dial and numerals have been debossed on the reverse side. The numerals and textured backing are gold plated internally, while the dial is similarly finished in silver.

Acrylic moldings for the clock are produced by Hoosier-Cardinal Corp., Evansville, Ind., which also performs the decorating operations, using its "see-deep" process for three-dimensional parts.

It's made of...

SPEED ALLOY

A NEW Time Saver Steel

for "these times"

This plastic mold, with yokes of Speed Alloy and hardened tool steel inserts, was made by Chicago Mold Engineering Co. Yokes were rough machined, then normalized, then finish machined, pack carburized, oil quenched and drawn at 450°F. Hardness of 58 Rockwell C resulted.

If you're tired of wearing down pencil points figuring jobs, Speed Alloy Hot Rolled Alloy Steel Plates are the answer. Users are calling it "the most economical mold and die steel available." Bridges the gap between carbon and tool steels. Deep hardening properties (surface hardness in excess of 40 Rockwell C, core hardness up to 37 Rockwell C, depending upon section, are typical) result from the addition of chromium and molybdenum, permitting use where relatively high compressive strengths are required.

Speed Alloy gives real ease of machining with economical high polishing of surfaces at varying hardnesses. Essentially an oil hardening steel, a wide range of physical properties are obtainable by varying heat treatments, allowing wide diversity of use ranging from zinc die casting dies and machined parts to plastic compression molds. Ask for Bulletin 905.

Speed Alloy plates stocked in widths up to 72" and thicknesses to 6" by Speed Steel distributors, which can be flame cut to specifications, an advantage not obtainable in competitive steels.

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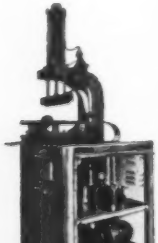
HIGH FREQUENCY SEALER

BARBERA'S popular new inflatable dress forms are startlingly light and inexpensive. . . Another case where plastic does it better, faster, cheaper, when there is an assist from THERMATRON.

As with Barbera of New York, hundreds of other vinyl processors in diversified industry are developing new products and improving old ones thanks to THERMATRON electronic sealing equipment. THERMATRON produces durable, air-tight, water-tight seams and controlled fit and shape because it *welds*, doesn't stitch . . . And does it in a fraction of the time and at a fraction of the cost of antiquated sewing and gluing methods.



If you are now working with vinyl plastics, or are thinking of new, never-before-tried plastic products, investigate THERMATRON. Standard models from ¼ KW to 6 KW serve most requirements—welding vinyl in thicknesses of .002" to .080"; or we can build to your special needs. Equipment also available for sealing cellulose acetate.

► Our application engineers will analyze your sealing problem without obligation. For a complete description of the THERMATRON line and its industrial uses, write *now* for Folder 51.

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"You pay for one every month without getting it".

That's what an ATLAS representative said to a plastics plant executive concerning the

ATLAS Type "E"

High Pressure Reducing Valve

shown at the left. In that plastics plant they were struggling along trying to handle a high pressure reducing job with unsuitable equipment. They were "getting by", yes, but the extra cost required was more than enough to buy a new ATLAS Type "E" every month.

What will Type "E" do?

It handles pressures as high as 6,000 lb. per sq. in. **without shock**—air, water, or oil. It performs like "clock work" because it is a result of more than a half century of experience in the making of regulating valves exclusively. For example the body of Type "E" is made entirely of the strongest forged steel. All of the internal metal parts are of hard chromium plated stainless steel. A formed packing of special material superior to leather is used which is immune to all fluids commonly used in hydraulic machinery. The pressure on the seat is balanced by a piston with the result that variations in high initial pressure have little effect on the reduced pressure. Ask for complete data.

For other ATLAS plastics plant products see the partial list in our ad in the January 1950 issue of MODERN PLASTICS

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COURTESY MONSANTO CHEMICAL CO.

Children cannot reach polystyrene aquarium hung as a wall decoration

Unusual Aquariums

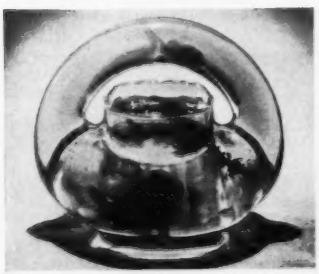
UNCONVENTIONAL design has been incorporated into two fish bowls, both molded of polystyrene, which were recently introduced to the consumer market—a market estimated to consist of from 15 to 20 million people who buy about 50 million aquariums annually.

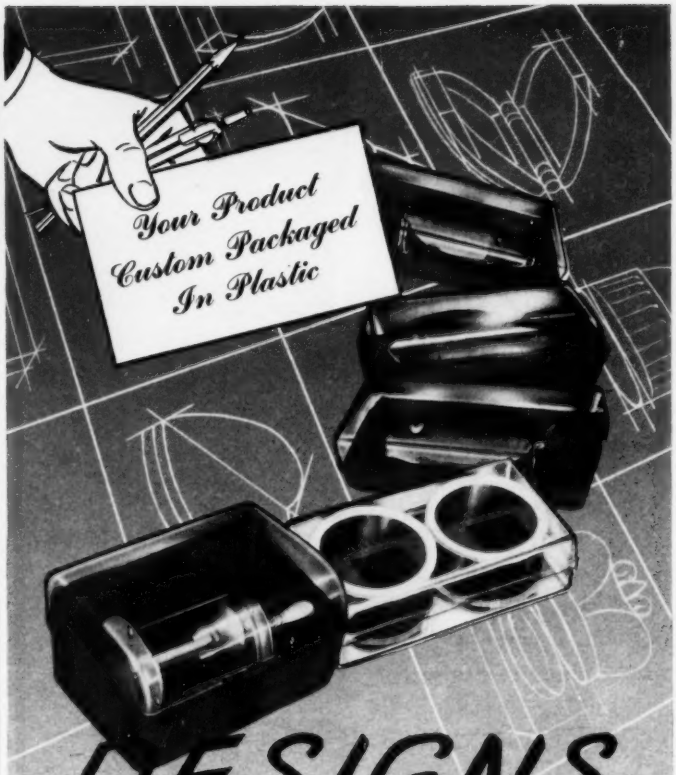
To keep it beyond the reach of inquisitive children and protect it from accidental spilling and breakage, the first aquarium—molded of Lustrex polystyrene by Michigan Plastic Products, Inc., Grand Haven, Mich.—has been designed as a wall decoration hung at picture height.

Basket-Shaped Design

The second fish bowl, known as the Aqua-Loop, was developed at Mt. Parnell Fisheries, Mercersburg, Pa., and is being molded by Nosco Plastics, Erie, Pa. Constructed in the shape of a basket, the bowl features a hollow handle through which fish can swim. The Aqua-Loop is produced on a single-unit mold with two cavities. After molding, the two halves of the bowl are cemented together.

Basket-shaped plastic fish bowl has loop handle through which fish swim





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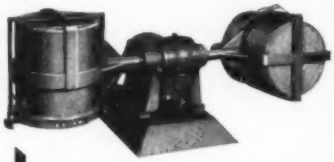
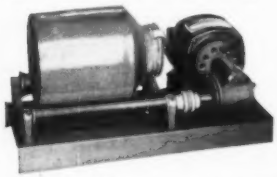
Roll any round container from a 5 gallon pail to a 70 gallon drum. Permit mixing in suppliers' drums, eliminating necessity of transferring contents to fixed mixing units. "U. S." Drum Rollers will handle loads up to 500 lbs. per drum. Available in sizes to handle 1, 2, 3 or 4 drums. Fixed or variable speed units.

● Our own plastics division, fabricators of Tygon and Duralon plastics, as well as other plastics manufacturers, have found these versatile, inexpensive units ideally suited to effective low cost mixing, grinding and blending of molding powders, pigments, stabilizers, plasticizers, etc. They simplify material handling as well as processing.



PAIL TUMBLER Designed to tumble 5 gallon round pails or fibre containers at a tumbling speed of 16 RPM. This lightweight (only 75 lbs.) compact unit has quick-opening, positive-locking clamps to speed up loading and unloading.



JAR MILLS — "U. S." *roller-type* jar mills are tops for mixing or grinding small batches of materials (wet or dry). Adjustable units will handle any round container from 3" diameter to 15", up to 12" in length (roughly 1 quart to 6 gallon capacity). Special patented roller design prevents jar creepage.

● Write for this free catalog on Mixing and Grinding Equipment. It points the way to better, lower cost mixing, grinding or blending of molding powders, pigments, etc. Ask for Bulletin 260.

U. S. STONEWARE
Akron 9, Ohio

Food Trays

DESIGNED for indoor and outdoor entertainment are two new refreshment trays molded of polystyrene which have recently been introduced to the market. The two plastic trays—one a small serving unit, and the other a picnic carrier—are molded and distributed by Columbus Molded Plastics Corp., Columbus, Ind. Both feature separate compartments.

The small serving tray, which is called the Serva-Tra, can be used for serving refreshments at parties as well as for service in the sick room. The Serva-Tra is divided into five compartments: a large compartment for food, two smaller compartments for food, a napkin holder, and a holder for a cup, which is an accessory. The tray is gated underneath the cup compartment. The polystyrene Serva-Tra, which measures approximately 7¾ by 5½ in., has molded-on feet to prevent surface scratches.

Cup Is Tip-Proof

The picnic tray, known as the Dina-Tra, has ten compartments: two large food compartments, five smaller food compartments, a napkin holder, and two other compartments to hold a tumbler and a cup. The cup and tumbler, which are tip-proof, are so designed that when inserted in the holders they touch neither the tray's wall nor the bottom of the holder. Thus, in serving iced drinks, condensation will run down into the holder. The Dina-Tra, which measures approximately 12 by 8¼ in., is center-gated. The Dina-Tra, like its junior counterpart, has molded-on feet to minimize surface contact.

Polystyrene refreshment trays have molded-on feet to prevent scratching

• MANUFACTURERS' LITERATURE •

To obtain any of the booklets or catalogs listed below, simply circle the corresponding number on the post card, fill in the information requested, and mail.

ION EXCHANGE RESINS
Laboratory manual describing column and batch operational methods, stability in the presence of various solvents, backwashing, regeneration, exhaustion, rinsing, and capacity of Amberlite ion exchange resins. 14 pages. The Resinous Products Div., Rohm & Haas Co. (3-600)

PANELYTE
The new Cameo design in high pressure laminated Panelyte is illustrated in some of its various uses. Many suggestions for the use of this material are listed. 4 pages. Panelyte Div., St. Regis Paper Co. (3-601)

CUTTING TOOLING TIME
Illustrated booklet giving the advantages, patterns, and specifications including prices, dimensions, delivery, and terms of the Crain-Ambrose process. 6 pages. French Williams Co. (3-602)

NICKEL ALLOYS
Data are presented on high-nickel alloys for service with chlorinated solvents, organic chlorination, inorganic acid chlorides. Applications in industry are illustrated. International Nickel Co., Inc. (3-603)

HEAVY DUTY CALENDER
A 24- by 61-in. three-roll heavy-duty calender available in three- and four-roll types for rubber and plastic industries, is illustrated and described with specifications and operational information. 4 pages. Wm. R. Thropp & Sons Co. (3-604)

CARBON BLACKS
Brochure of information on color and ink blacks, rubber blacks, and on data obtained under the electron microscope. 86 pages. Godfrey L. Cabot, Inc. (3-605)

KODAPAK SHEET FOR ELECTRICAL USES
Booklet discussing basic data on the properties of this thermoplastic cellulose ester which recommend it for a variety of electrical applications. 8 pages. Eastman Kodak Co. (3-606)

ACCELERATED WEATHERING
The Atlas Weather-Ometer—laboratory apparatus for ascertaining the trend of reactions which can be expected from average outdoor exposures on materials—is discussed. Illustrations are included. 32 pages. Atlas Electric Devices Co. (3-607)

ROTARY CHOPPING MACHINE
Bulletin giving information on the operation and applications of the Cumberland rotary chopping machine. 4 pages. Illustrated. Cumberland Engineering Co., Inc. (3-608)

FURFURAL
Information on research and development, available furans, manufacturing facilities, and uses of furfural, a versatile chemical for industry. 16 pages. Chemicals Dept., The Quaker Oats Co. (3-609)

DESIGN AND MOLDING OF PLASTICS
An 8-page booklet, describing the work of the Monsanto Technical Council, a group of ten specialists in various types of plastics whose counsel is available on design and molding problems. 8 pages. Monsanto Chemical Co. (3-610)

PERSPEX ACRYLIC SHEET
Information on protection of personnel, protection of product, physical properties, chemical properties, organic solvents, Perspex Acrylic materials, protective screens, dust and fume extraction, fabricating Perspex sheets, shaping of Perspex, etc. 20 pages. Imperial Chemical Industries, Ltd. (3-611)

ETHYL CELLULOSE
Property, formulation, and application data including blending chart, solvents, resins, plasticizer, and compatibility data and observations. Hercules Powder Co. (3-612)

COMPRESSION MOLDING
Four-page, three-color booklet giving properties, molding characteristics and technical data on Plaskon Alkyd molding compound. Plaskon Div., Libbey-Owens-Ford Glass Co. (3-613)

BURS AND ACCESSORIES
Catalog giving detailed specifications on Keller burs and accessories. Illustrated. 42 pages. Pratt & Whitney Div. of Niles-Bement-Pond Co. (3-614)

PRODUCTS AND SERVICES
The various products and services of American Cyanamid Co. for industry and agriculture are discussed. 64 pages. American Cyanamid Co. (3-615)

RECORD PRESSES
Illustrated folder describing and giving specifications for various Baldwin Southwark record presses (conventional four-column and tilting head types). 4 pages. The Baldwin Locomotive Works. (3-616)

KOPPERS PLASTICS
Price schedule for Koppers plastics including polystyrene 3, polystyrene 7, polystyrene 8, cellulose acetate, ethyl cellulose, and Koppers adhesive for polystyrene. 8 pages. Koppers Co. (3-617)

CALENDER
Advantages of the Z-type precision four-roll calender and the special design features which permit calendering a wide range of products to exact gage are discussed. 4 pages. Illustrated. Farrel-Birmingham Co., Inc. (3-618)

PREPACKAGING OF MEATS
Four-page folder in two colors including information about packaging cut meats in Lumarith, a "breathing" transparent film. Celanese Corp. of America. (3-619)

INJECTION MOLDING MACHINES
The Watson-Stillman Model 4E-100 vertical injection molding machine is discussed and detailed specifications and diagrams are given. Various other molding machines are mentioned. Illustrated. 8 pages. Watson-Stillman Co. (3-620)

CRYSTAL ROD
Price list for Plax crystal methacrylate rod. Miscellaneous information pertaining to this rod is also included. Plax Corp. (3-621)

FOAMING IN PLACE
Technical report describing formulation, mixing instructions, affecting factors, precautions, and ordering information for G-E phenolic foam which foams in place. 4 pages. General Electric Co. (3-622)

CONTROLLING STATIC ELECTRICITY
Informative brochure discussing the con-

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trol of static electricity on belts with "Dag" colloidal graphite. A diagram is included. 4 pages. Acheson Colloids Corp. (3-623)

GOOD-RITE RESIN 50
Illustrated technical service bulletin on Good-rite resin 50, RC-2, which is a high styrene-butadiene copolymer. Compounding and processing information together with typical recipes, tables, and graphs are included. 12 pages. B. F. Goodrich Chemical Co. (3-624)

HEATING AND COOLING FOR PLASTICS PROCESSING
Bulletin discussing heating and cooling with close temperature control for plastics processing. The advantages of the Hydrotherm system are outlined. 4 pages. American Hydrotherm Corp. (3-625)

POLYSTYRENE
Physical properties, features, and applications of Polystron, the Omni polystyrene, are presented. 4 pages. Illustrated. Available for export distribution only. Omni Products Corp. (3-626)

DU PONT PLASTICS
A brief summary of the properties and uses of the various Du Pont plastics, including Lucite, Polythene, nylon, etc. 12 pages. E. I. du Pont de Nemours & Co., Inc. (3-627)

HOBBED CAVITIES
Preparation of low-alloy steel for hobbing. Covers packing for carburizing, heating, quenching, and so on. Advantages of hobbed cavities are stressed. 8 pages. Midland Die and Engraving Co. (3-628)

PROTECTIVE COATINGS
Facts and figures on use of technical grade pentaerythritol in protective coatings for better weather resistance, gloss, and color. 32 pages. Heyden Chemical Corp. (3-629)

MOLDING FACILITIES
Custom molder's services described from design of product to finished molded parts. 8 pages. Erie Resistor Corp. (3-630)

VINYLITE RESINS AND PLASTICS
Forms, properties, and applications of vinyls, presented in non-technical language. Covers both rigid and non-rigid vinyls with suggestions on use in various manufacturing processes. Property data tables. 38 pages. Bakelite Div., Union Carbide and Carbon Corp. (3-631)

STAMPING MACHINES
Equipment for imprinting on plastics and a variety of materials and products by manufacturers, jewelers, stores, etc. 12 pages. Kingsley Stamping Machine Co. (3-632)

EDUCATION IN PLASTICS
How to acquire a sound working knowledge as a start toward a career in plastics. 8 pages. Plastics Industries Technical Institute. (3-633)

HYDRAULIC PRESSES
Loose-leaf catalog of data sheets on all types of hydraulic presses for plastics. Photographs, specifications, and technical engineering descriptions. Useful engineering data tables. R. D. Wood Co. (3-634)

STEARATES
Properties and uses of the more common metallic salts of stearic acid, including applications in the plastics industry. Witco Chemical Co. (3-635)

FIBERGLAS REINFORCEMENTS
Yarns, cloths, mats, and chopped strands of Fiberglas available for reinforcement of plastics. Information concerning resins used, types of products, and molding processes is included. Owens-Corning Fiberglas Corp. (3-636)

STOCK ITEMS
A diversified line of housewares, notions, toys, and giftwares is illustrated and are described. Victory Mfg. Co. (3-637)

RADIO AND INSTRUMENT KNOBS
Instrument knobs, pointer knobs, control balls, etc., illustrated and described. Dimensions are given. 14 pages. Kurz-Kasch, Inc. (3-638)

AROMATIC INDUSTRIAL SOLVENTS
A survey of the properties of aromatic solvents and the manner in which they are used. 50 pages. Barrett Div., Allied Chemical & Dye Corp. (3-639)

PLASTIC EXTRUSIONS
A folder-type catalog illustrating various tubes, rods, and extruded shapes. Yardley Plastics Co. (3-640)

PHENOLIC MOLDING COMPOUNDS
Complete data regarding the manufacture, use, methods of molding and selection of a variety of compounds. Includes chart outlining physical and chemical properties. 16 pages. Durez Plastics & Chemicals, Inc. (3-641)

RESPROID THIN FILMS
Sample book showing 12 colors of this 0.004-gage film. Respro, Inc. (3-642)

CLEARSITE PLASTIC CAPSULE VIALS
Pamphlet illustrates and describes a complete line of vials. Celluplastic Corp. (3-643)

PLASTICS FOR INDUSTRIAL PRODUCTION
Four-page brochure showing the many types of work done by Accurate Molding Corp. (3-644)

INJECTION MOLDING MACHINES
Illustrated folder describing what these machines are capable of molding and how they are operated. Specifications are given. 6 pages. Hydraulic Press Mfg. Co. (3-645)

ELASTRON
Description of flexible extrusions available, with suggested end-uses. 4 pages. Industrial Synthetics Corp. (3-646)

DRY COLORING OF POLYSTYRENE
Illustrated brochure describing the Jamison dry coloring process for polystyrene. Illustrations of the Jamison dry mixer are included, with specifications. 4 pages. H. Jamison. (3-647)

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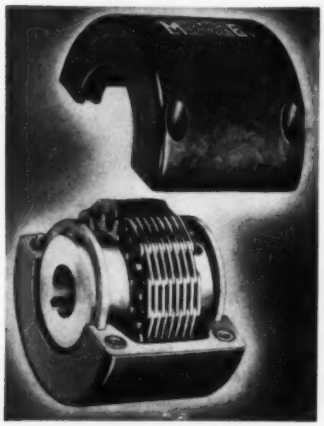
Coupling Cover

IN ORDER to assure efficient operation plus safety and proper lubrication, flexible chain couplings require easily removable housings. With these needs in mind, Morse Chain Co., Div. of Borg-Warner Corp., Detroit, Mich., has developed covers of rag-filled phenolic material which, unlike steel covers, are virtually immune to chemical attack and cannot rust.

Of split construction—with the two halves held together by slot-head screws engaging tapped inserts—the plastic housing can be installed in a space only slightly larger than the cover itself, and requires only a screw driver for easy assembly. Tapped, molded-in bosses for assembly screws are raised in one half to fit corresponding recesses in the other half.

Michigan Molded Plastics, Inc., Dexter, Mich., uses Durez 1905 phenolic to mold the covers, which are produced in five sizes. Rag-filled phenolic was chosen to provide maximum strength with minimum weight. Gaskets between the two plastic halves are fixed firmly in position to eliminate possible loss in assembly. Inner channels molded-in to the cover halves accommodate oil seals to provide an improved oil-tight fit on the coupling hubs. At the time of installation, plastic covers are filled with a high-grade lubricant.

Phenolic housing for chain coupling has molded-in bosses for assembling



Vinyl Stocks Vary in Color from Batch to Batch?

Wondering what the color of your next batch will be? Wondering whether your vinyl product will meet specified uniformity and quality requirements? If you are, take a tip from us. Check for absolute uniformity of raw materials! If this doesn't help—and your batch is formulated for correct stabilization—often you will find a variable in the uniformity of the stabilizer you are using. Careless stabilizer manufacturing methods may often result in unprofitable scrap loss. Unprofitable from a production cost viewpoint . . . *unprofitable to the future of the plastics industry when the market becomes flooded with production of cheap items produced from scrap!*

We recommend one cure. Formulate with absolute uniformity of raw material . . . stabilize with the most dependable stabilizers available.

To announce availability of uniform stabilizers is simple. To *deliver* stabilizers with dependable uniformity . . . from drum to drum . . . shipment after shipment means rigid quality control procedures must be set up through numerous manufacturing processes. Ferro offers all vinyl manufacturers a complete line of such stabilizers, formulated to a new high in technical excellence . . . stabilizers with dependable, uniform results, from order to order—batch to batch.

Remember, much of Ferro's research has been conducted jointly with some of the largest producers and users of vinyl resins. This background of experience can be brought to bear on your special problems. Write us for samples, prices or whatever additional information you might require.

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Cherry Pitter

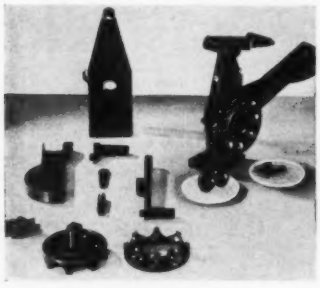
HOME canning, a seasonal occupation, requires equipment that will not rust or otherwise deteriorate during the off-season. A new all-plastic cherry pitter fulfills this requirement. Produced by Smith Hoover Industries, Kalamazoo, Mich., the pitter is so cleverly designed that its plastic mechanism gives precision performance.

Lustrex polystyrene was chosen as the material for the pitter because it is inexpensive to mold, dimensionally stable, and resistant to heat. Smith Hoover uses a nine-cavity mold which produces the parts for one complete pitter. Assembly, which takes about 10 min. per unit, is done by hand, using solvent cements on the permanent joints.

The operation of the all-plastic pitter is simple. Cherries, fed into the feeding trough by hand, roll one at a time into sockets spaced around the rim of a drum which is positioned at the end of the trough. When the crank is turned, a lug on the handle engages an arm of the star wheel. This moves the loaded socket into position so that a plunger, operated by the crank through levers, can come down through the cherry and socket, thus pitting the cherry. A spring-loaded bolt positions the socket and prevents the drum from turning during the plunger stroke. Another turn of the crank starts the pitted cherry on its downward fall, brings another socket into the pick-up position, and moves the loaded socket to the pitting post. Pitter is bright red.

Cherries can be pitted at the rate of one quart per minute.

Nine-cavity mold makes polystyrene parts for all-plastic cherry pitter



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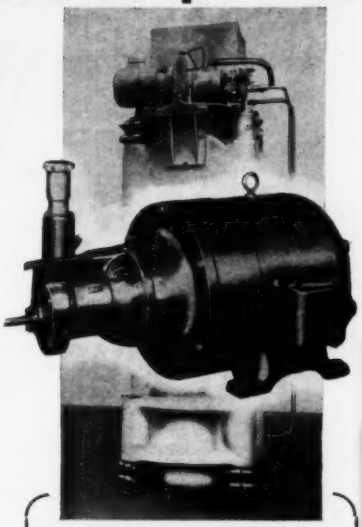

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By giving each of your presses its own *independent* ELECTRAULIC power plant, you achieve *more* than extraordinary performance . . . at the same time, you free them from dependence on a single accumulator system and the total work stoppage that any failure in such a system involves.

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This super-pressure, British-built* pump is available in models that maintain continuous working pressures ranging from 3,750 to 7,500 psi . . . with peak pressures up to 9,000 psi! Not only can each pump be used effectively with presses designed to work at these pressures, but each is equally suited for presses having lower pressure ratings—with valuable reserve pressure on tap when needed. Positively seated poppet-valve construction give every ELECTRAULIC pump a volumetric efficiency of 97%—considerably higher than conventional rotary valve pumps.

Since the ELECTRAULIC pump delivers at least double pressure, you need only half-size pipes and valves and half the oil volume for any given job. What's more, oil does not overheat and consequently, no cooling system is needed.

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Drink Dispenser

A SET of three beverage dispensers molded of Catalin polystyrene, with three accompanying jiggers, is now being marketed in a two-piece re-usable polystyrene container. Both the pourers and the containers are molded and sold by the Sterling Plastics Co., Union, N. J., under the trade name of Bartenders.

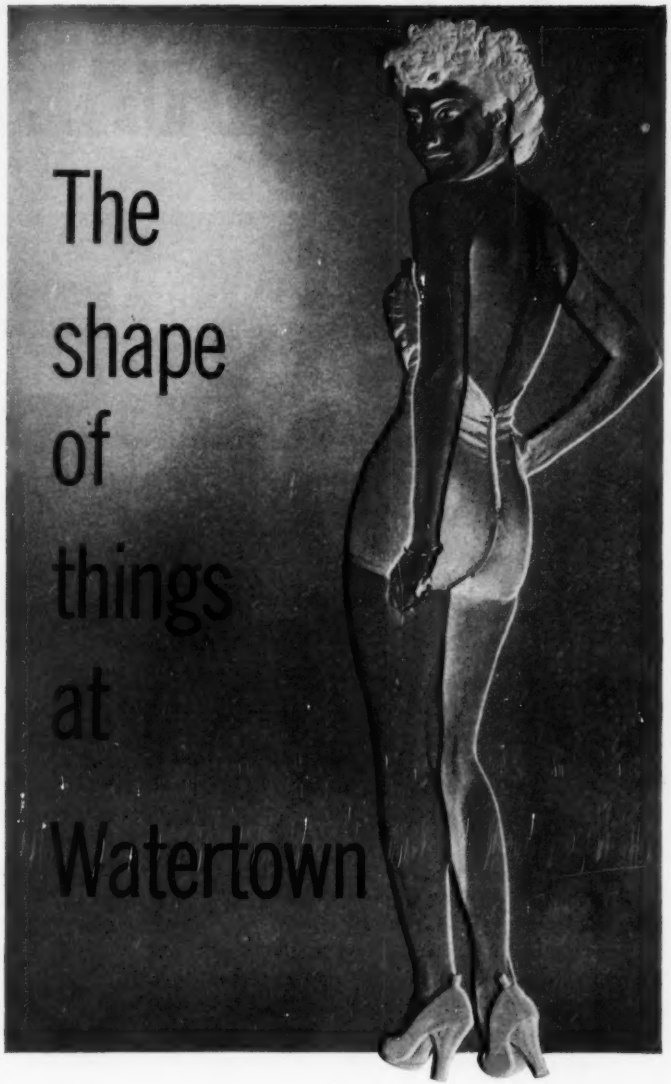
The pourers and the container are injection molded by Sterling in a multiple-cavity die. Polystyrene was chosen because of its dimensional stability, lightness, lack of taste and odor, appealing color value, and low cost of manufacturing which, in turn, permitted a popular selling price.

The pourers, which have tapered cork shanks that will fit any bottle top, are molded in bright red and are so designed as to eliminate air locks and to assure free flowing of the liquid.

The three glass jiggers packed with the set also serve as protective caps. When a jigger is inverted over the pourer's rim, it retards evaporation of the contents of the bottle.

The polystyrene container, which has a red-colored bottom and a transparent top, offers the purchaser re-use values. When the contents have been removed, the spacious bottom tray holds cigarettes, condiments, jewelry, pins, or other assorted small items. The transparent top piece can be used either as a cover for the bottom section or as a separate tray itself.

Polystyrene dispenser set is injection molded in multiple-cavity die



WHEN it comes to perfection in shapes and sizes, Watertown's designers and engineers have an enviable reputation. For Watertown's highly trained men have been shaping things . . . precisely . . . since 1915, custom molding to exacting specifications. Backed by a laboratory second to none in the industry, they are prepared to make everything in plastics by compression, injection and transfer methods, using both thermosetting and thermoplastic compounds. Special buffing and inspections are thoroughly accomplished with a minimum of handling — your assurance that each piece turned out by Watertown is solidly perfect in dimension and shape.

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More Profitable for You Than Ever Before

Series 52 "DUAL WORM"

50% increase in production

higher extrusion pressures

greater compounding efficiency

rapid purging

Here's big news for molders and extruders! The modifications that distinguish the Series 52 Compounder-Extruder provide for increased production and better plastic products at lower cost.

Worm length and drive power have been increased on all models, resulting in faster and greater kneading and blending of the feed materials. Feed materials with a high bulk density, heavy moisture content and large percentages of filler are readily processed. And the barrels on all Series 52 machines are so constructed that vacuum extractor attachments may be readily incorporated.

HIGH OUTPUT

With typical thermoplastic materials, the Model 2052 Compounder-Extruder (dual 2″ worms) produces an average of 150 pounds per hour; the Model 3552 (dual 3.5″ worms), up to 600 pounds per hour. These rates are based on a feed that consists of basic resins, plasticizers, fillers, colorants and lubricants. Cost analysis reveals that pellets and extrusions made with a Compounder-Extruder cost 5¢ to 15¢ less per pound than similar products made from compounded, colored and pre-dried resins.

VARIED PRODUCTION

For the molder precision pellets are produced . . . pellets that give top quality moldings of uniform color and finish . . . pellets that may be made in custom colors . . . pellets that are cheaper, and that yield the finest in molded products.

SELECT THE CAPACITY YOU NEED

Compounder-Extruder Model 52	Diameter of Dual Worms (each)	Average Poundage Produced Hourly	Horsepower	These Features Are Common to All
Series 2052	2″	150	12½	multi-zone heating jackets
Series 2852	2¾″	310	25	maximum temperature—650°
Series 3552	3½″	550	50	Torquentrol — continuous indication of mechanical torque with automatic overload cut-out
Series 4552	4½″	1000	100	replaceable barrel liners
Series 6052	6″	2000	200	interchangeable heads and extrusion dies

Compounder-Extruders

For the custom extruder the Compounder-Extruder produces finished products at the die from basic ingredients fed at the hopper. Tubes, rods, strips and a growing list of special extrusions are being produced.

For the material manufacturer the Compounder-Extruder is the most efficient means of compounding ever devised. It provides a flexible means for supplying customers with quality-pelleted materials for molding and extruding. A single unit will do the work of pre-drying equipment, mill rolls, heavy mixers and pelletizers.

RAPID COLOR CHANGE

The fast clean-out of the Series 52 Compounder-Extruder yields sensational dividends . . . *often enough to pay for the machine within a year!* Average clean-out time is only 15 minutes for change from deep opaque to crystal clear. In this operation, the machine runs at minimum speed and the material is fed at both the hopper and open barrel section. Moreover, the material used for flushing is not wasted. It can be reprocessed the next time the color being purged is run again.

Attachment of an extraction device converts Series 52 machines to Compounder-Extractor-Extruders for reducing the moisture and volatiles content of materials being extruded.

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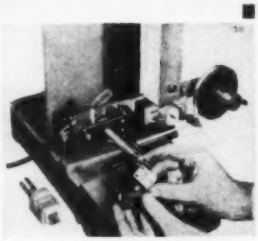
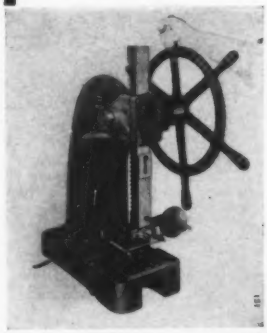
MAY BE ASSEMBLED IN ANY PRESS FOR MARKING IN COLOR

The unit includes type or die holder, a transfer color tape feed, heating element and thermometer.





The Hercules No. 3 unit, (or complete Hercules No. 3 press outfit) is only one of the well engineered marking machines for plastics marking offered by—

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AS WELL AS REGULAR VINYL MILLED AND CALENDERED FILMS . . . A BETTER STABILIZER FOR HIGH TEMPERATURES, ULTRA-VIOLET AND OUTDOOR AGING . . . .

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HARWICK STANDARD CHEMICAL CO.

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BRANCHES: BOSTON, TRENTON, CHICAGO, LOS ANGELES

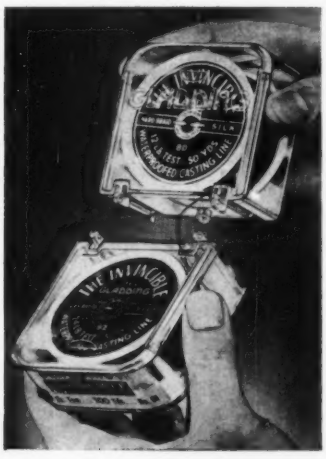
Fishing Line Box

DESIGNED to delight the heart of any fisherman is a polystyrene fishing line box which is re-usable for holding live bait, or leaders, and other small tackle. A water and chemical-resistant container, the package is molded of Dow and Bakelite polystyrene by Westplex Corp., Rochester, N. Y., for B. F. Gladding & Co., Inc., S. Otselic, N. Y.

Constructed as a two-in-one deal, the plastic container consists of a pair of injection-molded boxes hinged together, with each unit containing a spool of line that runs unbroken between the two boxes. The boxes are separated by detaching them at the hinges and cutting the line. Thus, the problem of selling the consumer a single spool of line while still encouraging the purchase of two spools at a time is solved.

An unusual design feature is a cover that slides freely on channels produced by cam action in the mold. A small depression molded-in to the top of the lid provides a finger grip on the cover. In order to obtain a good slide fit, a molding tolerance of 0.001 in. is held. The Gladding name and trademark are molded into the cover for continued company identification. Breather holes in the cover make the box useful for live bait.

Hinged polystyrene fishing line boxes hold two connected spools of line



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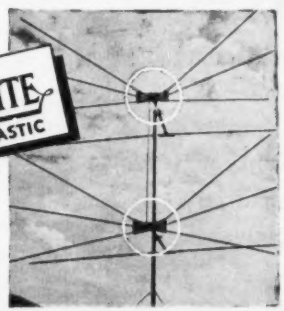
ANDERSON BROS. MFG. CO., ROCKFORD, ILLINOIS

Photo—Courtesy Channel Master Corp.



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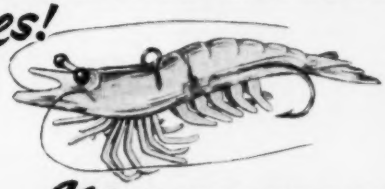

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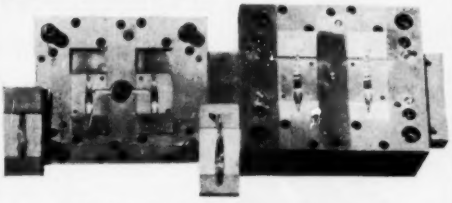
SAVE 50 to 75%

ON YOUR CAVITIES AND CORES

Here's the answer: Below is a photograph of a mold made by the Crain-Ambrose Process of precision cast cavities. The Patterns which were hand carved from plastic are also shown. This unusual mold, having such irregular parting lines, is not only difficult to produce by conventional methods, but would prove quite expensive.



. . . . with the Crain-Ambrose Process it was produced from an inexpensive pattern, conserving every minute detail, for an unbelievable price of only $62.50 per complete cavity. They were delivered in 7 days after pattern received, with a satin-smooth surface, free of flaws and defects.

(PHOTOS COURTESY FENCO CO., CORPUS CHRISTI, TEXAS; MOLDED BY MOLDED PRODUCTS CO., OF FORT WORTH, TEXAS)

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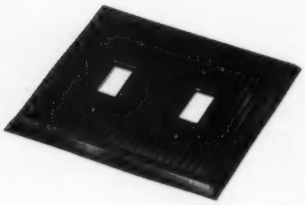
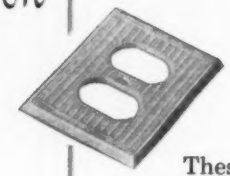
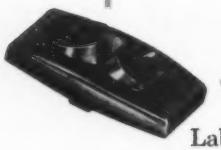


PASS & SEYMOUR

...design for Automatic Molding





These plastic electrical parts . . . all *designed* for molding on Stokes completely automatic presses . . . are produced by Pass & Seymour, Inc., Syracuse, N. Y.

Labor and material savings are large. Inventory is geared to daily requirements. High speed, long run automatic molding is foolproof, flexible, economical. Stokes fully automatic molding presses produce superbly finished identical parts, accurate in dimension, simple or complex, thin-wall or heavy section . . . at extraordinarily low costs.

Stokes offers assistance in part and mold design, plastics material selection, and choice of molding equipment . . . all for profitable production. Blueprints or parts are welcome for impartial design-and-cost analysis.

STOKES MAKES Automatic and Semi-Automatic Molding Presses, Plunger Presses, Closure Presses, Preforming Presses, Industrial Tabletting and Powder Metal Presses, Vacuum and Special Processing Equipment, Water Stills and Special Machinery.

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Please . . . a copy of Bulletin No. 500 describing the NEW Stokes No. 741 Completely Automatic Molding Press.

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S.P.I. Conference

(*Continued from page 86*)

tunities exist for low pressure reinforced plastics. Where heavy duty performance under conditions of high heat and moisture, where ease of punching and machining is necessary, where mechanical ruggedness is a factor, the ideal materials might be woven glass cloth with melamine or silicone resins; but the costs of these are very high and consequently cotton base phenolic laminates are frequently used. The mechanical and electrical properties of these, however, leave much to be desired.

Glass mat polyester laminates specially designed for the electrical field offer: 1) better heat resistance than cotton or paper phenolics; lower cost than melamine or silicone glass laminates; 2) better strength than cotton or paper base phenolics; 3) lower moisture absorption than cotton or paper phenolics; 4) far greater arc resistance than any phenolic laminates; 5) easier machining than glass cloth melamine or silicone laminates; and 6) easy moldability into special shapes.

The final technical session of the conference was a Forum moderated by Robert J. Brinkema and having on its panel: Clare E. Bacon, Owens-Corning Fiberglas Corp.; Dr. R. W. Ehlers, head, Plastics Compositions Unit, Office of the Quartermaster General; Dr. E. H. Haux, Pittsburgh Plate Glass Co.; C. D. Jones, Structurlite Plastics Corp.; James S. Lunn, Lunn Laminates, Inc.; Samuel A. Moore, Interchemical Corp.; John A. Owen, Sorg Paper Co.; D. G. Patterson, American Cyanamid Co.; Dr. Jesse Plummer, Glass Fibers, Inc.; Roger B. White, Laminated Plastics, Inc.; Arthur J. Wiltshire, Apex Electrical Mfg. Co.; M. K. Young, United States Gypsum Co.

Questions were answered concerning molds, pressure devices, filler selection, resins, catalysts, parting agents, bonding agents, adhesives, and finishing methods. In the discussion of finishes, Mr. Moore presented a report on the Polyfax process of facsimile reproduction of wood grains, leather, fabric, mother of pearl, and other patterns on molded products. Details will appear in an early issue of MODERN PLASTICS.

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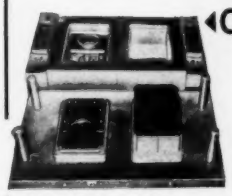

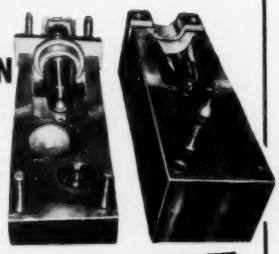

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Ordnance

(*Continued from page 90*)

and providing thermal insulation against chill by applying a relatively thick coating of plastic. Preliminary experiments with plastic-type coatings about 0.015 in. thick have been promising, but adhesion has not been entirely satisfactory and greater resistance is required to softening at high temperatures and to embrittlement at low temperatures.

Coating Compositions

A word of explanation is required about the three final applications which are to be mentioned. Two of these involve coating compositions, and one involves rubber compositions. Although plastics, adhesives, and polymeric materials in general have been assigned to the Ordnance Dep't. Plastics Laboratory, which is at Picatinny Arsenal, coating compositions specifically are assigned to Aberdeen Proving Ground, and rubber compositions are assigned to Rock Island Arsenal. I have been asked to include corresponding inquiries in this article.

The spray-drape or cocoon method of storage and protection is still in use, but there is room for extensive improvement. Spray-drape methods are required that can be applied rapidly, that will have low moisture-vapor transmission, moderate tensile strength, toughness at —65° F., low creep at +150° F., and good resistance to outdoor aging. In a somewhat related application, a sprayable coating is required which will bridge over holes ¼ in. in diameter, will dry rapidly, will have moderate tensile strength and good toughness from —65° to +150° F., and will possess ready combustibility.

Neoprene cable jacketing has shown satisfactory mechanical properties and resistance to lubricating oils at moderate temperatures but has not proved to be sufficiently flexible at —65° F. A neoprene or acrylonitrile-butadiene copolymer formation which retains good flexibility at —65° F. without serious sacrifice of properties at temperatures up to +160° F. would seem to be what is required.

In the field of solid propellants for rockets and guns, there are many problems closely resembling those which confront the plastics industry. We are certain there are plastics experts who could give valuable advice in the propellant program. It is hoped that any readers who believe they can assist in solving these problems will take the initiative in contacting the military service. One of the most widely used propellants is cellulose nitrate, or a mixture of cellulose nitrate with nitroglycerin. The experience and much of the fundamental scientific information which have been developed in connection with plastics and molding problems would be expected to be significant in connection with propellants.

As for the problems which are current in the Ordnance Dep't., if you have materials or solutions to offer you will presumably want to see us about them. Here's how the Ordnance Dep't. is set up:

In the department, there is a section for artillery ammunition, a section for rockets, a section for small arms, etc. Within each of these sections, each design engineer is working on certain specific items which fall within his section's scope. One design engineer is responsible for one entire rocket for example.

This would obviously require an impossible degree of diversity from the design engineer if he took upon himself sole personal responsibility for decisions about each part of the final item. Accordingly, the Ordnance Dep't. has a second group of materials consultants to whom the design engineer may delegate responsibility for individual parts required in the final assembly.

That is where the Ordnance Dep't's. Plastics Laboratory comes in; we are available to assist any design engineer who wants our help. Because of our specialized experience dealing with plastics, we can usually help him to select the best plastic for any specific application more quickly than he can do it by himself. The design engineer is not required to consult us about plastics if he does not wish to; he may consult anyone he pleases. However, most of the difficulty and troublesome problems in plastics find their way to the Plastics Laboratory at Picatinny Arsenal sooner or later.

S. P. E.

(*Continued from page 81*)

ing set-up, type of breaker plate, and heating and cooling facilities. In addition to these advances, he felt that the design should take into account the efficiency of operation from a manufacturing standpoint as well as the simplification of operation from the standpoint of the factory operator.

Extruder-Compounders

The next speaker, L. F. Street, Welding Engineers, Inc., stated that his company's extruder-compounder had been in the process of development for years, in fact, since before 1934. He described the machine and explained that equipment of this type has been successfully used for compounding and processing phonograph record material as well as elastomeric vinyls for garden hose, tapes, and wire coating. It also has produced satisfactory color dispersion in polystyrene when a pre-mix of the clear granules and pigment is fed to the extruder. Mr. Street stated that in his laboratory numerous other materials have been processed and that Type 6 nylon has been satisfactorily plasticized on the compounder-extruder. He further explained that his company's machine is suitable both for compounding and extruding and for the preparation of material for use by the molder or custom compounder.

Extrusion Problems

Concluding the speakers' contributions, Hans E. Buecken, National Rubber Machinery Co., explained his company's approach to controversial points of extrusion and extrusion equipment. He discussed the various types of screws and their advantages and disadvantages as well as the requirements for different metals in their construction. He approached liners, cylinders, and dies from the same standpoint, carefully outlining what he felt were the best designs and the best materials for their construction. He explained the feeding problems which resulted from the use of various types of compounds, as well as the problems encountered

(*Continued on page 172*)

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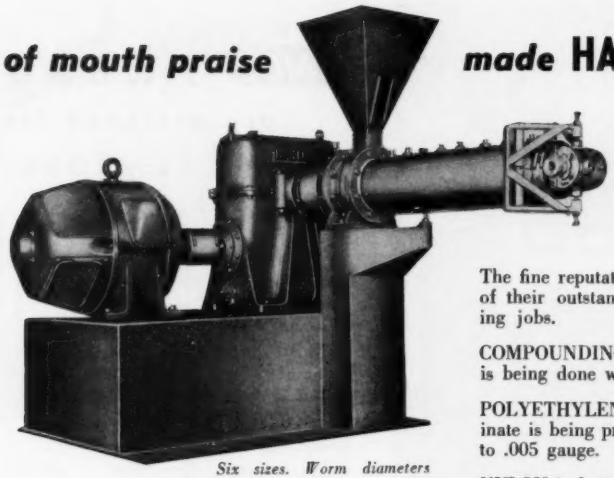

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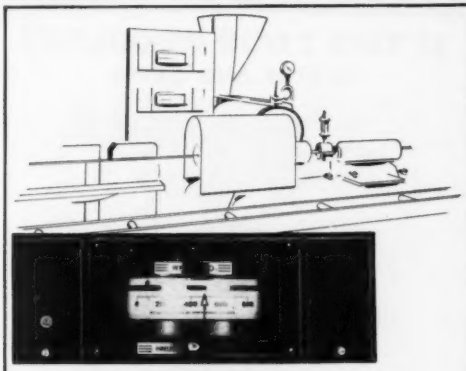

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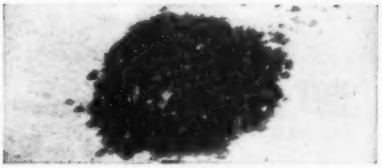

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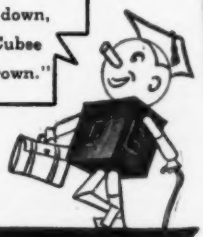

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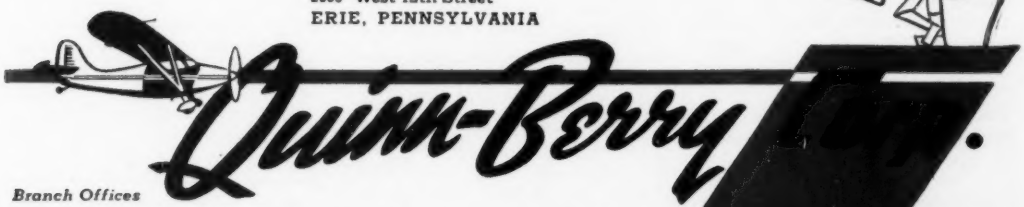

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when using raw material in different forms such as pre-densified materials, hot and cold strip, etc. He went into the subject of pre-heating by three methods; oven infra-red, mill, and high frequency, and outlined the use of various methods for accurately controlling cylinder and die temperatures.

Mr. Buecken then went on to discuss extruder drives and to explain the advantages and disadvantages of constant speed versus variable speed drives. He also discussed the controversial subject of single- versus double-screw extruders and their use as compounders, as opposed to the other methods of compounding.

Companies Registered

There were a number of companies intimately connected with the plastics industry which registered under a special company registration for this conference. Each company contributed materially to help defray the costs of this purely technical meeting.

Company registrations were as follows:

Materials Suppliers and Representatives: American Cyanamid Co.; American Molding Powder & Chemical Corp.; Bakelite Div. of Union Carbide & Carbon Corp.; The B. F. Goodrich Chemical Co.; Celanese Corp. of America; The Dow Chemical Co.; Durez Plastics & Chemicals, Inc.; General Electric Co.; Gering Products, Inc.; Hercules Powder Co.; Libbey-Owens-Ford Glass Co.; Monsanto Chemical Co.; Nixon Nitration Works; Plastic Film Corp.; Rohm & Haas Co.; Tennessee Eastman Corp.; Textileather Corp.; and United States Rubber Co.

Machinery Manufacturers and Representatives: Adamson United Co.; Beardsley & Piper Div., Pettibone Mulliken Corp.; De Mattia Machine and Tool Co.; Fellows Gear Shaper Co.; Hurlbut Paper Co.; The H. W. North Co.; The Hydraulic Press Mfg. Co.; Improved Paper Machinery Corp.; Industrial Mfg. Corp.; John Waldron Corp.; Lester Engineering Co.; Modern Plastic Machinery Corp.; National Rubber Machinery Co.; Stewart Bolling and Co.; United States Testing Co., Inc.; The Watson-Stillman Co.; Wheelco Instruments Co.; William R. Thropp and Sons Co.; and W. T. La Rose & Associates, Inc.

Laminates

(*Continued from page 120*)

strength" as defined by Leander, Schaub, and Asplund[3]. Equations for these characteristics are:

Impact resistance in p.s.i. $= \frac{12 \times 18\ W}{V}$

Impact flexural strength in p.s.i. $= \sqrt{\frac{12 \times 18\ E\ W}{V}}$

where W = work required to fracture the test specimen
V = loaded volume of the specimen
E = modulus of elasticity in flexure

At least four test panels were prepared for each reinforcing material from which test specimens were cut, machined, and tested. The values reported in the tables are the arithmetic means of the values so obtained for each property. The detailed results in Table V are test results from single specimens for one series of Fortisan panels which are typical of all the other panels.

Acknowledgement

This investigation constitutes one phase of a joint effort of the Industrial Research Institute of the University of Chattanooga and the Office of Naval Research, under N6ori-229, Task Order II. Acknowledgement is gratefully made to John R. Prigmore and James E. Gieseman for their help in determining many of the test properties.

Sources of materials were as follows: Selectron 5003, Pittsburgh Plate Glass Co.; Thalid 88087B, Monsanto Chemical Co.; Vibrin 132, U. S. Rubber Co.; Styrene, The Dow Chemical Co.; Span 85, Atlas Powder Co.; Syton, Monsanto Chemical Co.; Neozyme, Royce Chemical Co.; Chemical cotton, Southern Chemical Cotton Co.; Steralon, H. Frede and Co., Inc.; Ramie, Sea Island Mills, Inc.; Linen, Robert McBratney and Co.; High tenacity rayon, The Goodyear Tire & Rubber Co.; Fortisan, Celanese Corp. of America; Vinyon, National Filter Media Co.; Cellulose acetate, A. M. Tenny Associates; Vinyon N., Bakelite Div.; Saran, National Filter Media Corp.; Nylon, The Duplan Corp.; Casein-rayon, Casein-wool, Casein Corp. of America; Asbestos, Johns-Manville Corp.; Stainless steel, Newark Wire Cloth Co.; Fiberglas, Owens-Corning Fiberglas Corp.; Cotton sheeting—3.8 oz./sq. yd., J. C. Penny Co. —2.0 oz./sq. yd., Crystal Springs Bleachery; Fortisan square-woven fabric, Stern and Stern Textiles, Inc.; Wool suiting, Peerless Woolen Mills; Viskon, The Visking Corp.; Stymer, Monsanto Chemical Co.; Paraplex P-43, Rohm & Haas Co.; Plaskon 920-11, Plaskon Div., Libby-Owens-Ford Glass Co.; and Luperco ATC, Lucidol Div., Novadel-Agene Corp.

[3] Leander, H., Schaub, O., and Asplund, A., A.S.T.M. Bulletin No. 148, 89-94 (1947).

Table V.—Test Results

Property	*Panel*	*Values*		
Tensile strength, p.s.i.	A	23,400;	22,600	
	B	24,000;	23,500	
	C	22,800;	22,400	
Average		23,100		
Flexural strength, p.s.i.	A	20,600;	20,200	
	B	20,800;	20,300	
	C	24,900;	24,300	
Average		21,800		
Modulus of elasticity in flexure 10^5 p.s.i.	A	16.4;	16.4	
	B	18.8;	18.6	
	C	18.3;	18.1	
Average		17.8		
Edgewise compressive strength, p.s.i.	A	8,200;	8,100	
	B	9,000;	8,900	
	C	8,400;	8,500	
Average		8,500		
Burning rate, in./min.	A	0.43;	0.42;	0.44
Average		0.43		
Resin content, %	A			23.7
	B			23.3
	C			27.7
Average				24.9
Specific gravity	A			1.37
	B			1.37
	C			1.37
Average				1.37
Rockwell hardness	A			M89
	B			M91
	C			M89
	D			M92
Average				M90
Water absorption, %	A	6.6;	6.4	
	B	6.3;	6.1	
	C	6.0;	5.8	
Average		6.2		

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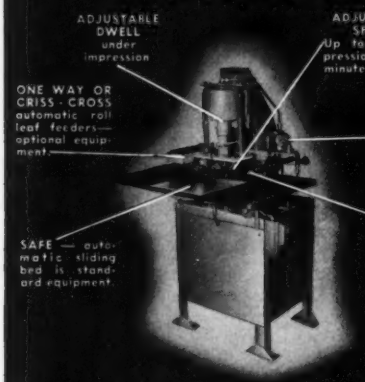
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THE PLASTISCOPE*

NEWS AND INTERPRETATIONS OF THE NEWS

By R. L. Van Boskirk

Polyester Plasticizers

A NEW polyester plasticizer said to combine many desirable properties of both the monomeric and polymeric types has been put into full plant-scale production by the Resinous Products Div., Rohm & Haas Co. Designated Paraplex G-60, the new product is characterized by low viscosity, high plasticizing efficiency, good behavior at low temperatures, light color, broad compatibility, and low cost.

As a plasticizer in polyvinyl chloride compounds, the new G-60 is said to bring low-temperature flexibility to polyvinyl sheet and film stocks. Partly because of its low viscosity, it has demonstrated its usefulness in the preparation of vinyl dispersion compounds such as organosols and plastisols. Also, it has been found to exert a useful stabilizing action on p.v.c.-type resins, producing compounds which appear to offer significant advantages by eliminating such objectionable characteristics as staining, opacifying, and spewing. Properties of the Paraplex are also said to permit economical formulation of vinyl lacquers of high quality.

Still another major use is as a combination plasticizer-stabilizer of chlorinated compounds. For instance, low concentrations of Paraplex G-60 have been found to improve the film strength, adhesion, and heat stability, and to increase the film toughness of coating compounds such as chlorinated rubber. The new G-60 complements rather than replaces G-25, G-40, and G-50, earlier members of the Paraplex family.

G-25, the highest priced of the series at 69¢ a lb., has higher viscosity and higher molecular weight than the others but is best of all in its lack of migration. It is used primarily for electrical compounds and upholstery. Its viscosity is too high for easy handling in film and sheeting. G-40 is a 43¢ compound and is easier to handle than G-25. G-60, at 39½¢ a lb., is the same price as G-50 but has an even lower viscosity and, as mentioned above, acts not only as a plasticizer but contributes toward stabilization. G-60 is also used for chlorinated waxes and rubber because it helps it "hold in" the hydrochloric acid.

Because of its low viscosity, G-60 is the best of this series to use with organosols and plastisols. Both G-50 and G-60 are frequently used as the carrier or vehicle when pigments are ground in a plasticizer and later dispersed in a resin. G-60 is recommended particularly as the polymeric plasticizer that comes closest to giving the combined properties of permanence for which polymerics are noted and of efficiency for which monomerics are noted.

The growth of polymeric plasticizers is indicated by the producer's statement that it has sold five times more G-50 in 1949 than in 1948. This increased sale did not come because users were increasing the percentage of the compound, but because more users adopted it as a part of their formulations. Thus in a formulation employing 33⅓% of plasticizer, about one fifth of that amount would be G-50.

Ink for Polyethylene

AVAILABLE in a complete line of colors, a new ink for screen and rotogravure printing on polyethylene is now being offered in limited quantities by the Hartford Empire Co. of Hartford, Conn. The ink, which was developed by Selectronic Corp., Montclair, N. J., can be firmly heat-bonded to the base material with no danger of flaking or picking, according to the producer. It is reported that printed designs will resist pulling off masking tape, finger-nail scratching, and bending tests.

A screen printer with a suitable type of belt dryer can employ these inks without modifying his equipment provided his plant is equipped with a high-type dryer. Heating in an oven at a temperature of 250° F. for 7 min. is normally adequate. If no oven is available, the operator may prefer to utilize application of a gas flame as a method of bonding the ink. Printed designs have a matte finish when bonded at oven temperatures and a slight gloss when flame treated.

In rotogravure printing, tests have shown that a printing speed of 60 ft. a min. is feasible with such heating between applications as is available with standard equipment. Favorable adhesion characteristics require that the printed sheet be heated to a critical temperature of about 200°F.

The printing problem has long been recognized as one of the principal factors handicapping more widespread development of polyethylene film, especially when it is intended for home furnishings or for packaging that requires display printing. Since polyethylene contains no plasticizer and is unaffected by solvents at room temperature, it is difficult to make ink adhere to the polyethylene surface. It is almost like printing on a metal surface because there is little absorption and no surface dissolving. Furthermore, because of its versatility, polyethylene is used for many diverse purposes, and an ink which might be satisfactory for packaging might not be satisfactory for consumer film. Another problem is that the ink must withstand stretch. Producers of the new ink believe that they have taken a long step forward in solving some of these problems.

Chicago Trade Fair

THE first United States International Trade Fair will be held in Chicago, Ill., Aug. 7 to 19, and is expected to stimulate international commerce by bringing buyers and sellers together in the heart of the world trading area. Approximately 2000 foreign manufacturers have already notified the U. S. Dept. of Commerce of their desire to exhibit their goods at that time. United

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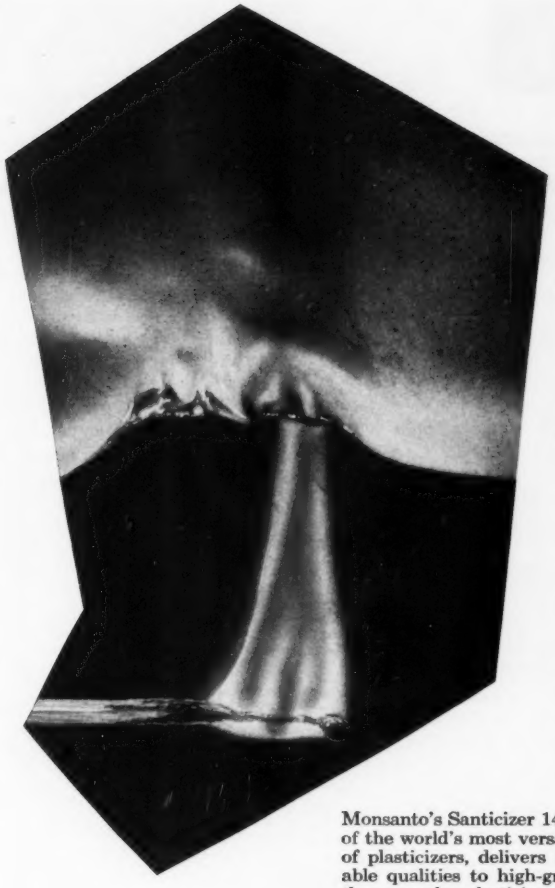

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States products are expected to occupy about one third of the display space in Chicago's Coliseum, the International Amphitheater, and Navy Pier.

Organosols and Plastisols

A NEW line of organosols and plastisols, known as Unichrome Compounds, is now marketed by the Organic Coatings Div. of United Chromium, Inc., 51 E. 42nd St., New York 17, N. Y.

Unichrome plastisols and organosols are delivered in paste-like form. The plastisols contain 100% solids, while the organosols contain a small percentage of liquid solvent or diluent. They can be molded, or they can be applied as coatings to metal, fabric, or paper, by dipping, spraying, or brushing. Upon baking at a temperature of about 350° F. for 20 to 30 min., the materials set and take on a rubber-like appearance. Coatings from 0.003 in. to 0.25 in. may be obtained with a single application.

S. P. E. Section Officers

THE South Texas section of the Society of Plastics Engineers has elected the following officers for 1950: president, Charles E. Shepherd of the Industrial Plastic Mfg. Co.; vice-president, L. D. Blackwell, Blackwell Molding Co.; secretary-treasurer, Willis L. Barnes, H. L. Thompson Co. All of the above named are from Houston, Texas.

Management Plan

A NEW development in management plans has just been announced by the Northern Industrial Chemical Co. It is an adaptation of the famous McCormick plan, and is believed to be the first time the program has been attempted in the plastics industry.

Briefly, the plan is to set up a Junior Board of Directors among employees of the company to function in cooperation with the Senior Board. The Junior Board will have the power, after a unanimous vote, to make recommendations on any subject it may choose, with the exception of wages and employee grievances. It is believed that the Board will be in a position to bring to light many subjects that are vital to the manufacturing operations of the company.

The plan is called "Northern's Multi-Management Plan." George V. Sammet, Jr., vice president and executive production manager, says the purpose is to give employees a greater participation in their company's affairs, to train executives, and to help improve the company affairs, manufacturing-wise, engineering-wise, and labor relation-wise. He further states that this plan retains the basic strength of private ownership and control while adding the essential advantage of group harmony and oneness of purpose.

In addition to the Junior Board of Directors, Northern Industrial now has a 15-week consultive supervisory training course; an appointment committee with which management consults when a position is open, to give advancement to firm employees before hiring from the outside; and a review committee consisting of four members of management and four members of the union which adjusts piece-work rates.

P.M.M.A. Re-elects Officers

PRODUCERS of plastics materials report continuing high demand for their products similar to the good demand existing in the latter months of 1949, and anticipate that 1950 will be another banner year for the plastics industry. Such was the analysis advanced by D. S. Frederick vice president of Rohm & Haas Co., when he was re-elected president of the Plastic Materials Manufacturers Association at its recent annual meeting in New York.

F. N. Williams, vice president of Monsanto Chemical Co. was re-elected vice president of the Association. M. G. Milliken of Hercules Powder Co., E. D. Ries of E. I. du Pont de Nemours & Co., Inc., and J. L. Rodgers, Jr. of American Cyanamid Co. were elected directors; J. R. Hoover of B. F. Goodrich Chemical Co. and Alan N. Mann of Catalin Corp. of America continue on the board of directors. F. H. Carman was re-elected seceretary-general manager and J. E. Walker, treasurer, for the coming year. P. A. Macy of Perkins Glue Co. will continue as chairman of the resin adhesives division.

C. R. Stock of American Cyanamid and chairman of the association's technical committee advised members of the results achieved in the research project sponsored at the Massachusetts Institute of Technology. "The testing machine and techniques that have been developed have pushed ahead the technology of plastics testing by many years," he said. "Practical proof of this is that at least three manufacturers are now offering equipment having features similar to, if not directly copied from those developed in the project laboratory." Research sponsored by material manufacturers at M. I. T. is now beginning its fifth year.

Modern Plastics Boston Office

IN ORDER that the business department of MODERN PLASTICS magazine may give better service to the New England territory, a new office has been opened at the Statler Office Bldg., Room 462, Boston 16; Tel., Hancock 6-1279. P. H. Backstrom, who for years has covered the New England territory out of the New York office, has been named to supervise operations at the Boston branch.

Color Dispersions

CONCENTRATED pigment dispersions in resins and plasticizers are now being marketed by the Acheson Colloids Corp., Port Huron, Mich.

The company has manufactured colloidal graphite dispersions for 40 years. Several years ago they initiated the production of a dispersion containing nigrosine in dimethyl phthalate for the coloring of acetate and nitrate sheet. The line has now been extended to include dispersed colors in polystyrene, polyethylene, ethyl cellulose, cellulose acetate, the vinyls, and a variety of plasticizers

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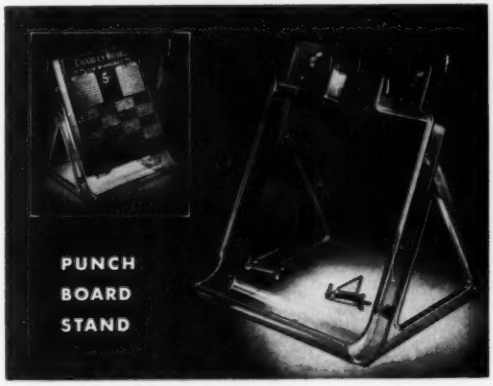

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which are sold in a conveniently granulated form for use in plastics or as a paste to be subsequently diluted with plasticizer.

Only concentrated carbon black dispersions in the aforementioned vehicles are carried in stock but the company is equipped to do custom disintegrating, dispersing, and stabilizing of pigments and dyes to specification.

The carbon black dispersions are being used particularly for pigmenting polystyrene where opacity and lustrous surfaces are called for.

Although dispersed pigments are slightly higher in cost than ordinary dry pigments, smaller quantities of the former are required. Furthermore, the manufacturer reports that dusting and consequent contamination of colors on adjacent equipment are eliminated, while processing and clean-up times are greatly reduced.

Heat and Light Stabilizer

NOW available from the Stabelan Chemical Co., Toledo, Ohio, a new heat and light stabilizer for polyvinyl chloride and its copolymers is called Stabelan E. The manufacturer asserts that this new product is the result of five years research and states it is one of the few compounds that can be used for both heat and light stabilization. It prevents discoloration of the resins during processing even at temperatures of 340° F., and has given longevity to clear and pigmented films in both accelerated light age testing as well as in Florida exposure testing. Very little lubricant, if any, is required in the formulations with Stabelan E. It is marketed in the form of a uniform paste and is easy to handle and to disperse in solvent solutions, organosols, plastisols, mills, and Banbury mixers.

Synthetic Wax for Organosols

CALLED Acrawax C, a new synthetic wax, will help to prevent blocking or sticking due to heat, pressure, or aging in coatings of various kinds, according to Glyco Products Co., 26 Court St., Brooklyn, N. Y., the producer. The material is recommended particularly for organosols. About 1% of powdered Acrawax is dissolved in the hot plasticizer and solvent, and then poured very slowly into a large batch of cold organosol while it is being vigorously stirred.

New Vinyl Plant

VINYL film and sheeting is being manufactured at a new plant, located in Stratford, Conn., recently opened by Ross & Roberts, Inc. The new plant is the company's second installation—the first is at West Haven, Conn.

The Stratford plant is equipped with a Farrel-Birmingham "Z" type calender. Motorized feeder and sifter and a magnetic separator deliver the resin from a supply tower to the equipment on the floor below, where it is automatically weighed and discharged to the blenders. Plasticizers are blended in agitated weigh-tanks and metered to the blenders by a precision-stroke pump operating in connection with a preset stroke counter, so that all major weighing is automatic and can be controlled from a panel board.

After the plasticizers are sprayed at controlled temperatures into heat-jacketed blenders, a signal notifies the Banbury mixer operator that he may draw material for further processing. From his panel board the Banbury operator weighs up the proper size batch, the weight being automatically printed on a tape as one of the many checks adopted for processing control.

From the Banbury mixer the hot stock is carried by conveyor belt to a plastics mill where it is cut into slabs and fed through a metal detector to the calender. A General Electric electronic control, operated from a single console, controls the speeds and tensions of the various operations of the calender train. At the operator's console, continuous gages indicate and record the thickness of each side of the film emerging on the calender.

The thermal system, which permits each roll of the calender to be operated at any desired constant temperature, is engineered specifically for this machine. The windup section incorporates automatic roll shifting, electrical indication of yardage, and daylight simulating lamps to insure proper color and quality inspection.

A separate room in the plant, kept at low pressure to avoid contamination of the operating floor, houses color-grinding and blending equipment with special hoods designed to protect the operators from the materials handled.

Unwoven Filler for Laminates

A NON-WOVEN fabric, series R, called Webril is now being offered by Kendall Mills, Walpole, Mass., as a reinforcement for plastics laminates.

In this fabric, the pure bleached cotton fibers are closely entangled into a well-integrated sheet of low bulk factor and good lamination strength. This sheet can be handled on impregnating equipment with no plucking or sticking to squeeze rolls. Due to the absence of binders or other impurities, it is the laminator alone who maintains control over the finished laminate.

This purity, coupled with the fact that the cotton goes into the saturating vat in the form of individual fibers rather than as yarns, allows thorough saturation, yielding laminates of low water pickup and good electrical properties. The even distribution of the fibers gives microscopically uniform reinforcement and excellent machining and punching characteristics, according to the producer.

For low pressure molders, Webril non-woven fabric is interesting because of its ability to conform to complex contours. Used as a surfacing medium for coarser, stronger fibers, it yields a smooth, pit-free surface which enhances the appearance of the finished articles.

Pressure Sensitive Tape

A NEW tape called Tuck #330 Vinelectric Tape has been announced by the Technical Tape Corp., New York 53, N. Y. The new tape, used on Type T synthetic insulated wire, is backed with 0.006 in.

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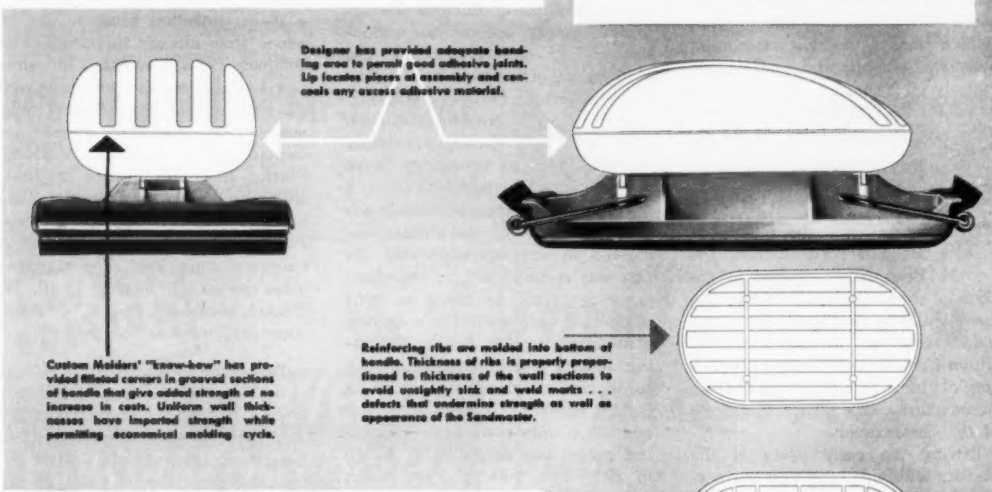
ANOTHER CUSTOM MOLDING CASE HISTORY

Styron was specified by the Custom Molder for the handle of this Red Top Sandmaster. Styron was selected because it could withstand the hard usage received by this product and meant lower material cost and faster assembly, and virtual elimination of finishing operations.


Designer has provided adequate bonding area to permit good adhesive joints. Lip locates pieces at assembly and conceals any excess adhesive material.
Custom Molders' "know-how" has provided filleted corners in grooved sections of handle that give added strength at no increase in costs. Uniform wall thicknesses have imparted strength while permitting economical molding cycle.
Reinforcing ribs are molded into bottom of handle. Thickness of ribs is properly proportioned to thickness of the wall sections to avoid unsightly sink and weld marks . . . defects that undermine strength as well as appearance of the Sandmaster.
Designer has utilized moldability of Styron to provide hollow section under top half of handle. This feature lowers material costs, gives a faster production cycle, yet retains excellent rigidity and strength.

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of synthetic resin and does the work of rubber insulating tape and friction tape. One roll contains more footage than three rolls of rubber insulating tape. It has an elongation of 200% and a tensile strength of 20 lb. per 1 in. of width.

Maleic Anhydride

COMMERCIAL production of maleic anhydride in briquette form has been announced by Monsanto Chemical Co., St. Louis, Mo. The absence of dust and fines, which are screened out, and the small exposed surface per unit weight (which makes possible minimum moisture pickup and subsequent hydrolysis) promises increased interest for the product in fields such as pharmaceuticals, wetting agents, and plastics.

Forty Years of Phenolics

FORTY years ago, the inventions of a Belgian born chemist, Dr. Leo H. Baekeland, resulted in the birth of a new industry and in the inception of a new company which today is known as Bakelite Div., Union Carbide and Carbon Corp. A special issue of *Bakelite Review* commemorates the 40th Anniversary of the organization.

During the early years of the plastics industry, American business was forging ahead with new inventions and new products. First to grasp the importance of the new phenolic materials, the electrical industry employed insulating coil supports molded from phenolic within the close limits of 0.001 inch as early as 1910. Today, phonograph records molded of plastic are considered brand new yet, as early as 1911, Thomas Edison selected phenolics in his search for a better record material. Telephones, today's quickly identifiable plastic product, utilized phenolic as early as 1914 when an earpiece was molded for the upright telephone. About 1915, when Kettering had perfected the self-starter, the automotive industry began using phenolics extensively. By 1916 there were over three hundred thousand Delco molded insulation sets in automotive electrical systems. By this same year, laminated plastics appeared in automobile timing gears. As early as 1918, phenolics invaded aviation, appearing in the ignition system of the famous Liberty engine. In 1920, a ten-foot propeller was built by Westinghouse from Micarta laminates.

As early as 1920, then, the plastics industry was old in experience and mature in development. The years between 1910 and 1920 demonstrated the possibilities of Bakelite plastics for the speedy, economical production of high quality products. The applications of the period show how the materials reduced assembly operations and promoted production economy. Tube bases, previously assembled in ten operations, were molded in one operation . . . a bakery thermometer, previously assembled in six operations was molded in one operation and the cost was reduced 36% . . . machine parts requiring as many as nine operations were molded in only two, eliminating turning, boring, threading, milling and chamfering . . . a banjo rim, previously produced in eight assembly operations, was molded in only one . . . a mechanical pencil was simplified in design to only two moving parts when molded of phenolic . . . a typewriter spacer bar was produced at 29% lower cost when it was molded of phenolic plastic . . . these and other applications show that modern plastics were proved as quality economical materials before 1930 and were ready for the cost-conscious years ahead.

During the early '30s when manufacturers were re-examining their own products with the hope of discovering some new and salient sales point, many turned toward product design where Bakelite plastics began to play a vital role.

As this trend toward better design in industry was growing during the '30s Bakelite executives held symposiums on design and conducted forums and conferences with leading industrial designers. Gradually these industrial designers began taking greater advantage of Bakelite phenolic plastics to achieve simplified functional beauty.

New materials also came into being during these years, including polystyrene introduced commercially by Bakelite in 1937 and elastomeric vinyls which were introduced in 1940.

This is a capsule version of the history and growth of Bakelite plastics, which is told in more detail in the historical January issue of *Bakelite Review*.

COMPANY NOTES

Norco Plastic, Inc., 3888 N. Fratney St., Milwaukee 12, Wis., has recently added a 4-oz., a 9-oz., and a 16-oz. injection press to the 10 which were already in service. The company also operates 12 compression and transfer presses as well as another plant in Butler, Wis. where five injection presses of various sizes are in operation. Norco Plastic, Inc., was formed in June, 1949, and took over the assets and liabilities of the former Norco Plastic Co. which had been in existence since 1945. The management personnel, headed by **P. W. Heckel**, president, and **E. C. Berg**, secretary, remains the same.

Tennessee Eastman Corp., Kingsport, Tenn., has announced the following personnel appointments for the new Texas Div., located at Longview, Texas: **David C. Hull** will be division manager, and **H. H. Imray, Jr.**, assistant division manager. Mr. Hull has been with the company since 1931. The new plant will manufacture chemical raw materials, the first unit producing synthetic butyric acid.

E. I. du Pont de Nemours & Co., Inc., is now exhibiting two additions to its line of supported plastic sheeting. One of them, manufactured with a fabric sheeting back, is light in weight and may be used for trim in places where strength is not a factor. The other is made with a strong sateen fabric back to give it greater tensile strength for heavy duty jobs. These two have been added to the line of Fabrilite supported vinyl plastic sheeting which was introduced a year ago and now

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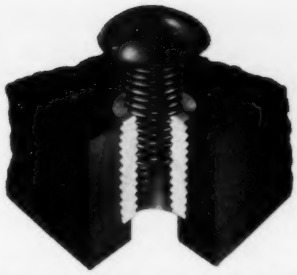

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gives the company three plastic sheetings available on sateen, broken twill, and drill-fabric constructions, in addition to its line of vinyl plastic sheets (without fabric back) available in 12- and 20-mil thicknesses. Prices on the unsupported sheet have recently been reduced 8% below previous minimums. **J. R. Owens**, sales manager, says the company felt that no single type of upholstery material could serve the varied needs of the seating industry.

Snyder Chemical Corp., Bethel, Conn., has announced a price reduction of about 5½ cents per lb. on Synco 135, a low pressure varnish for core-stocks. The average price reduction on Synco 418, a colorless grade for treating decorative papers and transparent overlays, amounts to about 2¾ cents per lb.

Chas. Pfizer & Co., Inc., has announced the retirement of vice-president **Elmer C. Otto** who had been with the company since 1912. **Karl J. Brunings** has been appointed assistant director of chemical research and development.

Behr-Manning Corp., Troy, N. Y., announces that **Dr. William E. Holland** has been made development manager of the company's New Product Development Dept. He had previously been with the Electro Technical Products Co., Div. of Sun Chemical Co. **Dr. A. J. Klemka** of South Boston, Mass., has been added to the company's Product Engineering Div.

Monsanto Chemical Co.'s Western Div. has purchased a small site at Santa Clara, Calif., and plans to begin construction soon on a plant which will produce synthetic resins and specialty coatings for the California area. **C. F. Trombley**, Monsanto's branch manager of chemicals and plastics at Seattle, has been made branch manager of the division's San Francisco office. **A. W. Hempelmann** will succeed Trombley in Seattle. Both have been with Monsanto since 1935.

Process Industries Engineers, Inc., Pittsburgh, Pa., which specializes in the design, application, contracting, servicing, and sales of complete equipment for the processing industries, has appointed **W. A. Coyle** as Western New York district manager. His headquarters are at 6578 Broadway, Alden, N. Y.

Lehigh University in cooperation with the **Society of Industrial Designers** announces that its second annual Product Design Seminar will be held at Lehigh University, Bethlehem, Pa. from June 26 to July 21, 1950. The program will consist of lectures and panel discussions with experts in various manufacturing processes. A descriptive brochure may be obtained from Lehigh or the Society of Industrial Designers, 48 E. 49th St., New York, N. Y.

Haas Process Corp., 211 E. 4th St., New York 9, N. Y., is now marketing a flexible mold compound for plaster casting which is a vinyl hot-melt product, 100% reclaimable.

Reed-Prentice Corp., Worcester, Mass., announces two new appointments: **Charles W. Coffin** as sales manager, and **J. D. Sherman** as sales engineer. Mr. Sherman will be located in the New York office.

E. V. Prentice Co., 2303 N. Randolph Ave., Portland 12, Ore., has been appointed exclusive Pacific Northwest sales representative for **R. D. Wood Co.**, Philadelphia 5, Pa., manufacturer of hydraulic presses.

The J. P. Lewis Co., Beaver Falls, N. Y., has announced the appointment of **J. C. Parsell** as general manager of the company's Plastic Products Div. Mr. Parsell will have charge of production and sales of Tensilite laminates.

Munray Products, Inc., sales division of **The Poly-Cyclo Products Co.**, 12400 Crossburn Ave., Cleveland, Ohio, has announced that **William A. Munkacsy**, president of **The Poly-Cyclo Products Co.** has been elected president of the sales division. **Ray W. Grace** remains as vice president in charge of sales.

The Baldwin Locomotive Works, Philadelphia, Pa., has recalled **C. H. Marshall**, who has represented the Baldwin Testing Equipment Dept. in New York, to fill an important post at the home office. He has been succeeded in the New York area by **H. G. Graff**, formerly of the Boston office.

Cincinnati Industries, Inc., Cincinnati 15, Ohio, has announced that **Victor E. Calvin** has been appointed director of product engineering, a newly created position. **William H. Fogarty**, who has been in the company's jobber sales section, will work with Mr. Calvin.

A. E. Sierad Co., Inc., 805 Mamaroneck Ave., Mamaroneck, N. Y., has been formed to process bright gold, silver, and other finishes on plastics, glass, metals and wood. **A. E. Sierad** is president and **Stanley Sapery** is vice president of the newly created organization.

United Lacquer Mfg. Co., 1001 W. Elizabeth Ave., Linden, N. J., has announced a new dual-purpose lacquer known as Base XC 14 for use on cellulose acetate and butyrate.

Hayes Adhesives Co., 4159 Union Blvd., St. Louis, Mo., has been appointed a Pliobond distributor by the **Chemical Div., The Goodyear Tire & Rubber Co.**

The G. S. Blodgett Co., Inc., Burlington, Vt., announces the appointment of **Edward J. McKeever** as sales representative in the Eastern Middle Atlantic states area.

Cast Optics Corp., manufacturer of cast polystyrene sheet, and cast CR-39, announces the removal of its plant from Mineola, N. Y. to a new and larger plant at 1 Post Rd., Riverside, Conn.

Acheson Colloids Corp., Port Huron, Mich., has announced elec-

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tion of three new vice presidents. They are **P. C. Buck**, who takes charge of production; **M. W. Reynolds**, in charge of sales; and **Raymond Szymanowitz**, in charge of research.

PERSONAL NEWS

J. Russell Watt has been appointed sales manager of industrial laminates and insulating materials for the Chemical Dept. of the **General Electric Co.**, with headquarters at Coshocton, Ohio. He joined the company as priority clerk in 1942, and was appointed sales representative of the Chemical Dep't. in 1946.

John P. Remensnyder has been elected president of **Heyden Chemical Corp.**, 393 Seventh Ave., New York, N. Y., to succeed **Bernard R. Armour**, who died Dec. 1, 1949. Mr. Remensnyder has been vice president in charge of company sales since 1944. The firm's Management Committee—consisting of the new president, **R. Lulek**, and **S. Askin**—which was appointed after Mr. Armour's death, will be continued.

Haskell H. Fritz has been elected vice president of **The Baker Castor Oil Co.**, and will be located in the company's head office at 120 Broadway, New York, N. Y.

John L. Goodrow, formerly with the **Prolon Plastics Div. of Pro-Phy-Lac-Tic Brush Co.**, Florence, Mass., has been appointed sales manager of the custom molding division of **Rogers Plastic Corp.**, West Warren, Mass.

Dr. George Zinzalian has been appointed sales manager of the **Technical Products Div., E. F. Drew & Co., Inc.** 15 E. 26th St., New York 10, N. Y. He has been in the organization for 16 years.

Robert Brinkema, plastics engineer, has resigned as an associate of Egmont Arens, industrial designer, and has formed his own company at 510 Oakland Ave., Oakland, N. J.

United Engineering and Foundry Co., Pittsburgh, Pa., announces the election of G. G. Beard as executive vice president. Mr. Beard is also president of **Lobdell United Co.**, Wilmington, Del. and of **Stedman's Foundry and Machine Works, Inc.**, Aurora, Ind., both subsidiaries of United Engineering and Foundry Co. He has been associated with the company since 1927.

Amplex Mfg. Co. recently moved to a new plant and office at 2325-31 Fairmount Ave., Philadelphia 30, Pa. New facilities include one of the largest oven units in existence for acrylic fabrication. Installation of a large twin-cylinder air press provides facilities for forming the largest sheets of acrylic now available. Production in 1950 is expected to double last year's output. Amplex pioneered in the development of the familiar plastic canopy which the firm now produces for many food super markets. Amplex is also responsible for pioneering seamless plastic letters for indoor and outdoor use.

Julius Bellak has been placed in charge of all plant operations at the new address, and **Jack Benkin** has been appointed to the sales staff and will be active as a field representative.

Herbert R. Gross of Caldwell, N. J., has been elected president of **Applied Resins Corp.**, 304 Oraton St., Newark 4, N. J.

George M. Hartley has been appointed manager of the **General Electric Co.**'s Glyptal alkyd resin plant in Schenectady, N. Y.

Louis A. Fisher has been named president of **Fabricon Products, Inc.**, and its subsidiaries.

Dr. Franklin T. Peters has been transferred from the Sales Dep't. of **Glyco Products Co.**, 26 Court St., Brooklyn, N. Y. to the newly formed Development Dep't.

Paul Blum, formerly manager of the chemical and plastics department of **Alan D. Oppenheimer, Inc.**, has formed the **Paul Blum Co.**, with plant and offices located at 315 Larkin St., Buffalo, N. Y.

MEETINGS

Feb. 26-March 1—Regional meeting of the American Institute of Chemical Engineers, Swampscott, Mass.

Feb. 27-March 3—A. S. T. M. Committee Week and Spring Meeting, Hotel Penn, Pittsburgh, Pa.

March 2-4—1950 Spring Conference, Pacific Coast Section, S.P.I., Hotel Del Coronado, San Diego, Cal.

March 8-15—National Assoc. of Variety Stores, New York, N. Y.

March 6-17—American Toy Fair, Hotels New Yorker and McAlpin, New York, N. Y.

March 16—S.P.I., Boston-Providence Chapter, "What the Purchasing Agent Looks for in Plastics," Hotel Beaconsfield, Boston, Mass.

March 20-26—A.S.T.M., Committee D-20 on Plastics, Old Point Comfort., Va.

March 28-31—National Plastics Exposition, Navy Pier, Chicago, Ill.

April 4—S.P.I. Philadelphia Chapter Meeting, Sansom House, Philadelphia, Pa.

S.P.E. Meetings

March 13—Upper Midwest Section of S.P.E. at Coffman Memorial Union, University of Minnesota, Minneapolis, Minn. A representative of Pyroxylin Products, Inc., Chicago, Ill. will speak.

March 15—South Texas Section of S.P.E. in Houston. Thomas E. Orr, vice president, Plastic Engineering, Inc., Cleveland, Ohio, will discuss "Problems of the Injection Molder."

Can You Clean Your Dies and Kettles *CHEMICALLY?*

You can . . . if your dies are *Duranickel* and your kettles are *Lukens Nickel-Clad Steel.*

Lukewarm soda ash solution will clean a *Duranickel*® die or *Nickel-Clad* kettle in a few minutes!

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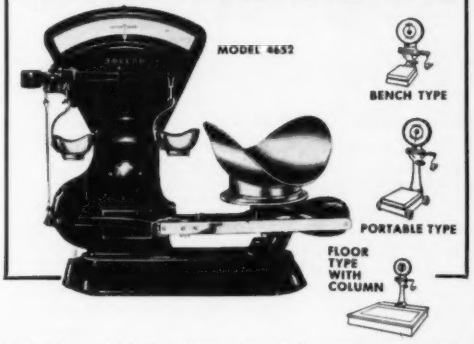

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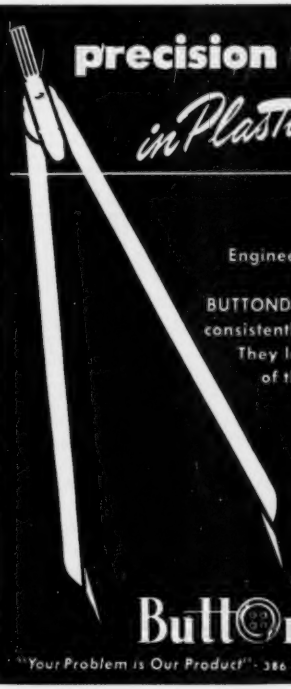

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INJECTION MOLDING MACHINES

32-48 oz. Impco Injector, new '45, used in conjunction with standard plastic press for large molds	9900.00
12 oz. W. S. new '45, running	9500.00
8 oz. W. S. '41 overhauled '43	6950.00
8 oz. Leominster, new '47	8950.00
8 oz. W. S., new '44	4550.00
7 oz. H.P.M., '41, 9 oz. chamber	4500.00
6 oz. W. S., new '42	5950.00
4 oz. Lester Phoe. 1V4, new '46, vertical	2500.00
4 oz. Reed Pren. '40, new	1500.00
2 oz. Reed Pren. 10A, new '46	3050.00

PLASTIC HYD. PRESSES—
SELF CONTAINED

Southwk latest type, 260 T, 24" x 54" H.P.M. 200T, SL Type, ram 14"x 13½", platen 36"x36"	Offers
Southwk 350T, platen 24"x42", 2-12" cyl.	Offers
Bliss Styles Type Mechanical, 10T, Flywheel in rear	1750.00
French Oil 200T, 16" ram, platen 24"x24", new '42	100.00
French Oil 450T, 24" ram, platen 45"x35", new '42	2475.00
Stokes Pre-Forms, Model #280, 10HP	2950.00
Plastic Try Out Screw Press, new '47, platen 36"x36"	1350.00

MIXERS

Day 50 gal. tilt. type, 7½HP, MD	495.00
Hobart 30 gal., motor drive	230.00

PUMPS

Loewy, 2500PSI, 270 gal. new '44	8500.00
H.P.M. 2200PSI, 26 gal. new '43, 15HP	1250.00
W.S., 2000# 5.8GPM, new '41	575.00
New Vicker's M. V135, 15HP, 1000#, 176GPM	195.00
Northern, 15GPM, 15HP, 2600#, excellent	750.00

MISCELLANEOUS

Farrel Reducer 500 HP, new '43, 5 to 1	2500.00
Cleveland Reducer 75HP, 26½ to 1	650.00
Toledo continuous weighing scale	450.00
Oxygen Bomb for aging plastics	275.00
Devine Vulcanizer & Vac., 3'6" x 4', hyd.	800.00
P & W Model BL2416, Keller Duplicator	6500.00
West. Elec. Pre Heater 5KW, 440/1/60, new '46	2750.00
West. Elec. Pre Heater 10KW 440/3/60, new '46	3190.00

EVEREADY CO., E. J. McCALLUM
Prop., 805 Housatonic Ave., Bpt. Conn.

FOR SALE: Lydon Pre-Heater for injection molding complete with 24 trays built in 1946; excellent condition, $600.00 F.O.B. our factory. Astor-Ramel Mfg. Co., 395 Brook Ave. Bronx 54, N. Y.

FOR SALE: 1—Stokes Model 'R' Preform Machine. Excellent Condition, Priced right. Phone Stillwell 6-8037 or write Box X215, Modern Plastics.

FOR SALE: Steam type preform preheater with 2 stainless steel drawers to handle up to 4½" diameter preforms complete with circulating Fan, temperature dial indicator and industrial type steam reducing valves. Reply Box 226, Modern Plastics.

FOR SALE: One 50 ton moving down 4 column type vertical press 15" stroke, 24" daylight, approximately 24" x 24" between columns, complete with pump, intensifier and 5½" x 6' weighted type accumulator including cast iron weights. Reply Box 306, Modern Plastics.

FOR SALE

Two new plastic insulating systems for wire. One with 1½", one with 3½" tuber. Both complete with dual friction letoffs, cooling troughs, constant tension dual reel takeups and variable voltage system drives. Offered at attractive price and one week delivery subject to prior sale. For further information reply Box X216, Modern Plastics.

FOR SALE: 2 5HP—200 lbs. pressure Eclipse steam boilers. Gas fired. Complete with low water cut off, injector and other fittings. 1 Speedylectric steam boiler, Model 632, 200 lbs. pressure. All boilers in good condition. Reply Box 209, Modern Plastics.

BECK SHEETER FOR SALE: 36½" knife width, cut off 17" to 71", complete with jogger capacity 36" x 48". 3HP motor A-1 condition. Used until recently when our plastic dept. was discontinued. VANANT PRODUCTS INC., 730 W. Virginia Street, Milwaukee, Wisconsin.

FOR SALE: Banbury Mixer like new, never been used since it had $1200.00 chromium job. Complete with reduction gears—V belt drive—27 HP gear motor—starter-controls. Price $3000—F.O.B. Bellmore. The Perfectoloid Co., Bellmore, N. Y.

FOR SALE: 100 Ton and 150 Ton Stokes Molding Press & Pumps; 300 Ton Dunning & Boschert, Molding Press; 300 Ton W. S. New Hobbing Press; 300 Ton W. S. Press 24 x 20 Platens; 175 Ton H. P. M. 30 & 30 Platens; 85 Ton Stewart Boiling 20 x 20 Platens With Electric Plates; 50 Ton 18" x 18" Elmes, With Electric Plates, Handpump Operated; 500 Ton Waterbury Farrel 3 Post Press; 800 Ton Waterbury Farrel 22" x 24" Platens; Watson-Stillman 75 Ton 15" x 15" Platens; 35 Ton Oilgear Shaft Straightener 84" Long Bed; Carver & Watson Stillman Lab. Presses; Hydro Pneumatic & other type Accumulators; Platon & Oil Pumps. AARON MACHINERY CO., 45 Crosby St., N.Y.C.

FOR SALE: Injection Presses: 2, 4, 6 & 8 oz Reeds, 2 & 4 oz HPM, 8 oz Lester, 1 oz vertical NRM. Extruders: 2½" NRM, 6" oil heated. NE. 40' NRM Conveyor. Ovens, Granulators, Tumbling Barrels, Temperature Circulators, Apex rd. obj. print. mach. Preco Labpress. 1-HPM 9 oz Hastelloy Heat. Chamber. 1—Laminat. Press 10 op. 30"x30" Pl. 1—Stokes 150 tons mod. 252 auto. closure press. Pumps. 1—Eclipse 3 HP gas boiler. 50 & 100 tons Compress. Presses. 150 Tons self contd. Compr. Press. Kux No. 50 single punch, Kux No. 25 rot. Preform presses. Icecube Cup and Drawerpull used Inject. Molds. Justin Zenner, 833 W. Sheridan Road, Chicago 13, Ill.

HYDRAULIC PRESSES REBUILT TO SPECIFICATIONS for plastic items, industrial purposes and phonograph record presses. We have in the used equipment (1) Baldwin-Southward 8" x 8' stroke, 2000# W. P. weighted accumulator $2000, (1) 400 ton, 32 x 45, 18" ram, 36" stroke, 12' daylight $2200 (1) 300 ton 30 x 46, 18" ram, 24" stroke, $1800, (1) 400 ton 22 x 30, 16" ram, 18" stroke, 36" daylight $1500. (2) 150 ton 42 x 46, 12" ram, 36" stroke, 60" daylight $900 each, (6) 250 ton 32 x 66 12" double ram, 48" daylight, 15" stroke, flange type packing $1850 each. Hydraulic Sal-Press Co., Inc., 386-390 Warren Street, Brooklyn 2, New York.

SAVE WITH GUARANTEED REBUILT EQUIPMENT — HYDRAULIC PRESSES, 24"x24", 18" ram 318 tons; 24"x54", 260 ton, multiple opening; 24"x24", 16" ram, 250 tons; 24"x24", 12" ram, 170 tons; 24"x42", 2—12" rams, 340 tons; 42"x42", 10" ram, 250 tons; 36"x52", 14" ram, 385 tons; 36"x 36", 12" ram, 141 tons; 20"x18", 10" ram, 118 tons; 20"x20", 10" ram 118 tons; 19"x 24", 10" ram, 78 tons; 22"x15", 8" ram, 75 tons; 27"x21", 8" ram, 75 tons; 15"x15", 8" ram, 75 tons; 12"x12", 7½" ram, 60 tons; 12"x12", 6½" ram, 50 tons; 8"x9½", 4½" ram, 20 tons; 16"x16", 3½" ram, 12 tons; Laboratory Press 30 tons 6"x6", Mills Laboratory, M. D., THROPP 16"x49" M. D. Mill; NEW DUAL PUMPING UNITS, all sizes; Worthington Triplex 12 gal. 2200#; 4 plunger 6 gal. 2000#; Extruders Royle Rubber & Plastic 2" units; PREFORM MACHINES, Stokes R & T, Colton 5½T and Stokes DD8-4 with Reeves Drives, also Mixers, Calenders, Vulcanizers, Accumulators etc.

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TWO—24x24—four post 154 Ton Hydraulic Presses complete with individual pumping units and controls.
ONE—30x30—four post Hydraulic Press complete with pumping unit and controls. Low pressure—up to 900 P.S.I.
ONE—Robertson 10 Spiral Blade Mixer.
ONE—3 H. P. Boiler Complete—gas fired.
STOUT MFG. CO., P. O. BOX 47, LITTLE ROCK, ARKANSAS.

FOR SALE: Farrell 18" x 45", 16" x 48" & 15" x 36", 2 roll rubber mills. New 6" x 12" Lab. mixing mills & calenders. Other sizes 30" to 84". Royle #2 perfected extruder, and other sizes. 500 ton Hydr. molding press 42" x 48". Field 500 ton 25" x 30". Francis 175 tons 24" x 18". Albert 100 ton 2 opening 24" x 24". 40 ton broaching press. Also presses 20 to 500 tons from 12" x 12" to 36" x 36". Hydr. oil pumps. Vickers, Oilgear, Northern, etc. Watson-Stillman Hor. 4 plgr. 1" & 2" x 4" H. & L. pressure pump. HPM 1—¾" x 6" vertical triplex 10 GPM 2700 lbs. Elmes 1" x 4" & 1—½" x 4" hor. 4 plgr. 5 & 8 GPM 4500 lbs. & 5500 lbs. Elmes 2" x 6" Horiz. 30 GPM 2500 psi. Ramsey 4½" x 8" vert. triplex 65 GPM 900 lbs. Elmes 2½" x 4" hor. 17 GPM 800 lbs. Hydr. steam pumps. Low pressure pumps 150 to 600 lbs. Hydr. accumulators. Stokes automatic molding presses. Stokes rotary preform tablet machines 1—3/16", 1—½" and ⅝", also single punch. Injection molding machines 2 oz. to 16 oz. Baker Perkins jacketed mixers 200, 100, 50, and 9 gals. capacity. New and used rotary cutters. Rubber mills, calenders, Banbury mixers, etc. Heavy duty mixers, grinders, pulverizers, gas boilers, etc. Partial listing. We buy your surplus machinery. Stein Equipment Co., 90 West St., N. Y. 6, N. Y. WOrth 2-5745.

FOR SALE
INJECTION MOLDING MACHINES

1—16 Ounce H.P.M.
4—12 Ounce Watson & Stillman
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1—6 Ounce Watson & Stillman
2—6 Ounce Lester
1—4 Ounce Reed-Prentice
1—2 Ounce Reed-Prentice ($2000.)
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TRANSFER & COMPRESSION PRESSES

450 Ton Sheridan (compression)
390 Ton French Oil Mill (transfer)
300 Ton French Oil Mill (transfer)
221 Ton French Oil Mill (transfer)
75 Ton Watson & Stillman (manually hydr.) Above are all late type, self-contained. WE CARRY A COMPLETE LINE OF MACHINE TOOLS AND MOLD MAKING MACHINERY AT ALL TIMES.

R. A. PETERSON & CO.
P. O. Box 303
SPRINGFIELD, MASS.
PHONE 3-7903, WIRE, WRITE

Machinery and Equipment Wanted

WANTED: Plastic machinery or entire plants. We will buy out-right or trade. R. A. Peterson & Co., P. O. Box 305, Springfield, Mass. Phone 3-7903. Wire. Write.

WANTED: 8 oz. Reed Prentice, Model 10D preferred, injection molding machine. 8-12 oz. Watson Stillman '46 or later, injection molding machine. 16-34 oz Impco Injection Molding Machine. Plastic Machinery of all kinds bought and sold.

EVEREADY SUPPLY CO.
E. J. McCallum, Jr
805 Housatonic Ave. 4-9471
Bridgeport, Connecticut

WANTED: Complete Machinery for modern artificial horn (Casein) button industry wanted for export such as extruders, rod-trimming machines, blank slicing-machines, automatic turning machines tumbling drums, presses etc. Send full specifications and offers to Box 205, Modern Plastics.

WANTED: Preferably in Midwest location used 2, 4, 8 and up to 16 oz Injection presses in good working condition. Scrap-grinder, Drying Oven, also small lab extruder. Reply Box 211, Modern Plastics.

WANTED: Scrap grinders in good condition. Reply stating make, size, age and price. Reply Box 225, Modern Plastics.

WANTED: LAMINATING EQUIPMENT—Have immediate need for one, two or three laminators. Frames and rolls wide enough to pass 36" or 46" web widths. Prefer high class stainless equipment arranged for heated pans and rolls, of roll coater with doctor roll type, but can rebuild any suitable type to fit requirements. Advise make, specifications, price, and where may be inspected. Reply Box 203, Modern Plastics.

WANTED: Reed Prentice or Lester 8 oz. Injection Molding Machines. State price, condition and year purchased. Reply P. O. Box 1059, Pawtucket, Rhode Island.

(Continued on Page 188)

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Pioneers in Plastic Fabrication Since 1910
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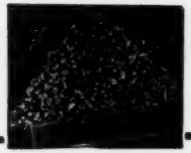
FOR UNIFORM MOLD FLOW... start with uniform granulation...



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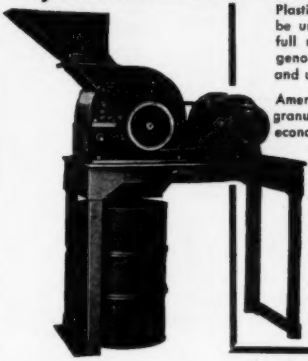

Plastics scrap granules must be uniform in size to assure full moldability . . . homogenous polymerization . . . and uniform flow in the press.

American KC's achieve this granular uniformity—in a fast, economical, once-through operation — by *the clean, shearing action* of hard tool steel cutting blades and *proper screen sizing.* Fines are held to an absolute minimum. Capacities from 250-450 pounds per hour.

Welded steel plate construction prevents damage from accidentally fed metal inserts.

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Originators and Manufacturers of Ring Crushers and Pulverizers
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OPERATING TEMPERATURES TO 650° F

The Royle Temperature Control Unit is designed to eliminate uncertainty in extrusion and other industrial processes which require accurate and constantly maintained operating temperatures of extended periods of time. This compact and simply operated unit will supply—or drain—heat in accordance with process specifications as established by laboratory experiments. Features are built into the self-contained Royle Temperature Control Unit to assure maximum results with a minimum of maintenance.

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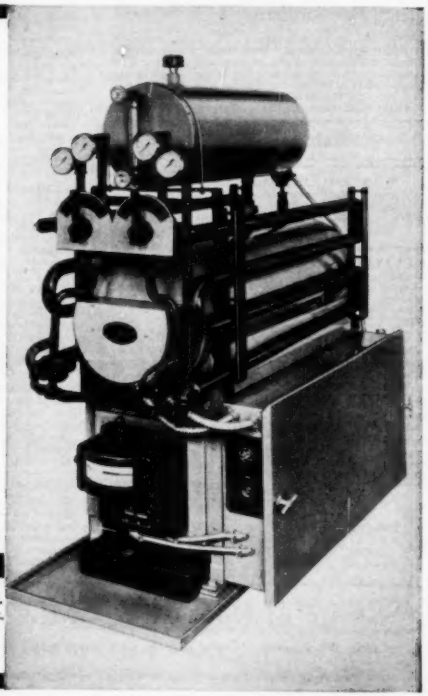

CLASSIFIED ADVERTISING

(*Continued from Page* 186)

WANTED: 1 machine of 1-2-3 or 4 oz. size for Injection Molding, in first class condition, 110-220-60-Cycle. Boxed ready to ship. Will consider whatever you have. Reply A. I. I. Mgs. Co., Hartington, Neb.

WANTED: 16x42 or 16x48 two roll mill, a laboratory two roll mill, and either a Cumberland or Ball-Jewell granulator. Reply Box 206, Modern Plastics.

2235 and 2209D3 Stokes Automatic Molding Presses wanted by electrical manufacturer. Please write Box X220, Modern Plastics.

WANTED: Complete plants, also individual items such as: Mixers, grinders, 2-roll mills, extruders, etc. Reply Box X219, Modern Plastics.

Material For Sale

FOR SALE: 4,500 pounds virgin Maroon polyethylene .40¢ per pound F.O.B., Clinton, New York. Recent purchase from material manufacturer, surplus to our needs. Sample on request. Thermold Corporation, Clinton, New York.

WANTED:—NYLON SCRAP—NEW OR SCRAP NYLON EITHER FM 10001 OR FM 1000. SCRAP MUST BE CLEAN AND FREE OF CONTAMINATION. MOLDED PRODUCTS CO., P. O. BOX 7221, FORT WORTH, TEXAS.

PLEXIGLAS AND LUCITE
New Material .060, .080, .100, .125, .150, .187, .250, .312, .375, below list price. No charge for cutting to size.

Special Discount .312 clear, new material, 36x48", 40x50", 47x72", 38x60", 44x80", 50x50", 50x80", 66x82".
ARISTOCRAT PLASTICS, INC., 55 Clarkson St., New York, N. Y. WAtkins 4-4216.

EXCESS INVENTORY FOR SALE: Strip Acetate, .005 thickness Eastman F-116 formula 1000 ft. rolls packed as received from Factory. 750,000 sq. inches ⅝" wide. 1,-120,500 sq. inches 1¼" wide. Also 30,000 pcs. 9½ x 9½" same formula and thickness. Clean new sheeting. Write us for price if interested. Food Display Cover Co., Inc., 317-24 Transportation Bldg., Indianapolis 25, Ind.

FOR SALE: 250 pounds VB 1925 natural Vinylite transparent film two thousandths thick, 36 inches wide in two rolls. Also 250 pounds same 18 inches wide in four rolls. Make offer. 400 plastic hobby kits $1.00 each. G. D. RICHARDSON MFG. CO., 400 Jefferson St., Fort Collins, Colorado.

Materials Wanted

WANTED: Reground clear Styrene and Methacrylate also reground transparent colored Styrene Sprues and runners also acceptable. Plastic Manufacturers, Inc. Stamford, Conn.

WANTED: Plastic scrap or rejects solid colors, also mottled in any form Cellulose Acetate, Butyrate, and Polystyrene. Highest prices paid by Manufacturer. Reply Box 212, Modern Plastics.

WANTED: Plastic Scrap, Rigid Vinyl, Cellulose Acetate, Polystyrene, Polyethylene. Custom grinding, magnetizing, compounding, and straining of contaminated plastics. Franklin Jeffrey Corporation, 3671 McDonald Avenue, Brooklyn, N. Y. ES 5-2943.

WANTED: PLASTIC Scrap or Rejects in any form. Acetate, Butyrate, Polystyrene, Acrylic, Vinyl Polyethylene, etc. Also wanted surplus lots of phenolic and urea molding materials. Custom grinding, magnetizing and compounding. Reply Box X222, Modern Plastics.

WANTED—SOLVENTS
WASTE OR VIRGIN
Also Surplus
Plasticizers-Molding Materials-Plastics Color-Pigments-Waxes, etc.
CHEMICAL SERVICE CORP.
96-04 Beaver St., New York 5, N. Y.

Help Wanted

CHEMIST OR CHEMICAL ENGINEER experienced in vinyl compounding, and preferably in electrical insulating field, needed to take complete charge of product development and control lab. Knowledge of Nylon, Polyethylene extrusion beneficial. Excellent opportunity in broad field, combined with chance to live under ideal conditions on West Coast. Give full details in your reply. Box 303, Modern Plastics.

PLASTICIZER SALES—Medium size chemical concern requires services of capable plasticizer salesman. Position offers excellent opportunity for progressive, productive technical salesman to establish himself as department manager of an increasingly important division. Openings in Eastern, mid-Western and West Coast areas. Applicant should have both field selling and laboratory compounding experience. Knowledge of the vinyl plastics industry is important. Please submit complete resume of training and experience, personal snapshot, and indication of initial salary requirements. Reply Box 301, Modern Plastics.

REPRESENTATIVE wanted by Custom Molder, established 20 years: compression transfer, plunger. Factory located New York State. Desires representation commission basis. State territory, lines carried. Reply Box 229, Modern Plastics.

PLASTICS ENGINEER or foreman with experience in low pressure laminates; polyesters; large shapes. Send full resume including salary requirements. Reply Box 204, Modern Plastics.

EXTRUSION SALESMAN WANTED—Well established extrusion company, just moved to larger quarters and is expanding sales. The man we want must have imagination to utilize the many items we have produced in volume and expand sales on new items we have developed. Send complete resume and salary expected. Keystone Plastics Inc., 84-88 Johnson St., Newark 5, N. J.

MECHANICAL ENGINEER — Experienced in plastics or die casting. Complete knowledge of construction of tools, molds, and special machinery required. Must be able to handle men. Excellent opportunity with well established injection molder in northern New Jersey. Submit resume. All replies kept confidential. Reply Box 207, Modern Plastics.

EXTRUSION MAN, experienced to operate a growing plant. This man must know thermoplastics and calculate costs. He must be familiar with purchasing, management, die design, rigid tubing and shapes. This is a growing plant in a small midwest town and is a splendid opportunity for a wide awake individual to grow with Company. Give experience, salary desired, availability. Box 213, Modern Plastics.

REPRESENTATIVE wanted. Several territories are open to experienced representative in custom plastics sales, *on commission basis*, for molder equipped to do compression-transfer and injection molding. Please state experience and territory in which you are now operating. Box 218, Modern Plastics.

WANTED experienced man to manage Extruded products division of well known Company. Must have thorough knowledge of materials, organization. Wonderful opportunity for right man. All replies kept strictly confidential. Our present employees know of this ad. Box 307, Modern Plastics.

REPRESENTATIVE WANTED
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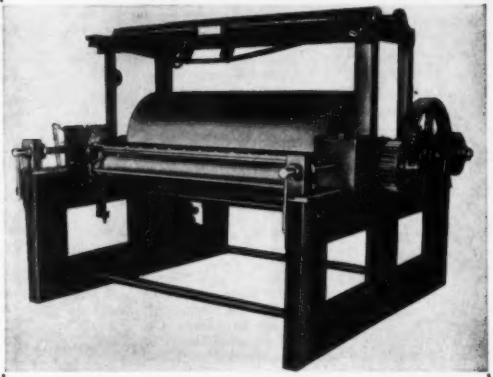

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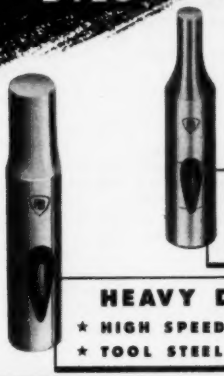

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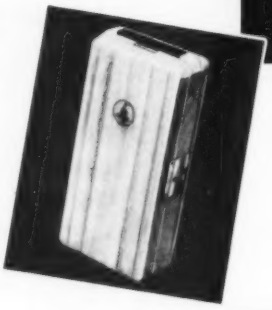

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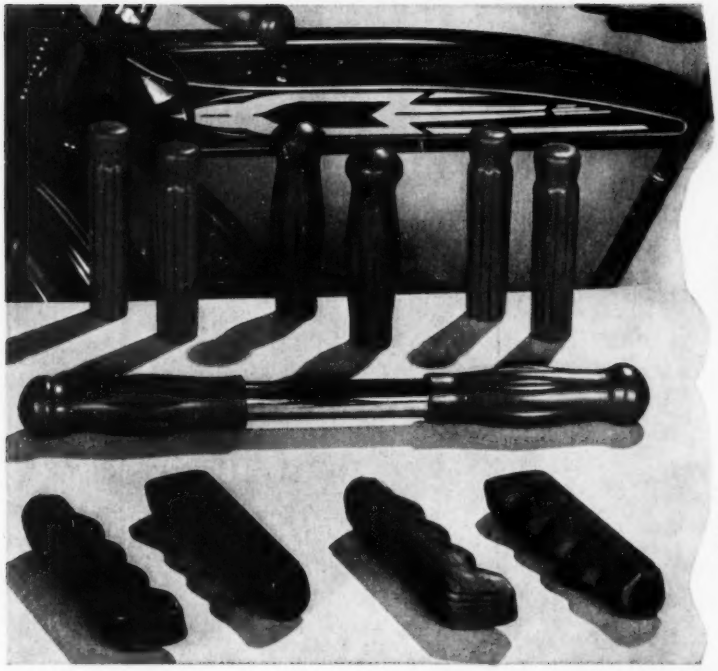

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